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Demographic and psychological factors influencing academic success in a college level human anatomy course

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DEMOGRAPHIC AND PSYCHOLOGICAL FACTORS INFLUENCING ACADEMIC SUCCESS IN A COLLEGE LEVEL HUMAN ANATOMY COURSE

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DEDICATION

Completion of this work was due to the encouragement, strength, and love bestowed upon me by a very special person in my life. His ability to always see the good in everything and spread that goodness to others has helped me become a better person. Quitting is not in his vocabulary thus it became my mantra as I spent days at the computer while knowing at the end of the day he would be there. Support is such an over-used word when speaking of obtaining a doctorate but that is because without it the journey becomes very lonely. There were times I thought this meant more to him than to me but I realized it was just another way of convincing me sacrifices were part of the worth.

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ABSTRACT

The primary purpose of this study was to determine the influence of selected demographic and psychological characteristics on the academic achievement of students enrolled in an undergraduate human anatomy course at a research-extensive university in the Southern region of the United States.

As health care in the United States becomes increasingly strained due to a decreasing ratio of health care workers, educating more students to fill this gap has become a societal issue. Human anatomy forms the foundation of all health care professions. From the molecular to the macroscopic, anatomy provides a unique and necessary perspective of the human body. This material is necessary for a base of knowledge in medical professions. Thus, the need exists for higher education to identify reasons students succeed or fail in the capstone course of human anatomy.

This study's population was defined as undergraduate students enrolled in a semester-long human anatomy course at a research-extensive university for the fall 2005 and spring 2006 semesters. Data were collected using three researcher-designed instruments based on the literature and course documents.

A significantly positive relationship was found between self-efficacy and final grades received in human anatomy. Using regression analysis, college grade point average and self-efficacy were found to account for 7.2% of the variance in final grades of the students in human anatomy.

The researcher concluded that self-efficacy can be used as a predictor of final grades in human anatomy. Therefore; the researcher recommended further research to measure levels of self-efficacy at intervals throughout a semester. By doing so, students whose

self-efficacy is low can be identified and interventions implemented to aid student success. Interventions recommended were peer tutoring, smaller class size, academic support from the university, and more interaction between students and faculty. Additional recommendations were for higher education administration, educators, and enrollment managers to collectively find ways to help dispel some of the academic angst in future students.

CHAPTER 1

INTRODUCTION

Problem Statement

Health care in the United States is becoming increasingly strained as an entire population of citizens grows older. By the year 2030, 26% of the U.S. population will be aged 65 or older, compared with 17% today. As our society grows more mature, the American health system will undoubtedly suffer from a decreasing ratio of health care workers to those needing aid. Health care workforce is crucial to the delivery of critical care to those in need. Persistent nationwide shortages of physicians, nurses, and health care professionals of all types already have taken a toll on the present overall healthcare system.

At the heart of this debate is the need to educate more people in the medical profession. Evidentiary support for this lies in workforce statistics in fields of physicians, nursing, physical therapy, occupational therapy, physician's assistants, and other related allied health professions. Increasing the numbers of professionals is only beneficial if those being educated are adequately prepared to deliver health care that is based on fundamental knowledge of these professions.

Human anatomy forms the foundation of all health care professions. From the molecular to the macroscopic, anatomy provides a unique and necessary perspective of the human body. The academic content of anatomy is comprehensive and is often viewed with anxiety and apprehension due to the amount of detailed knowledge needed to successfully complete the course. And because the material is necessary for a base of knowledge in the medical field, students may perceive the course as a deterrent to their

intended career goal. Undeniably, a solid foundation in anatomy is the best preparation for a successful career in the medical field.

There exist numerous reasons for student success and failure in undergraduate-level human anatomy. Exposure to science in high school, poor instruction in previous science classes, societal norms, self-efficacy and outcome expectancy just to name a few. Unless we as educators identify the reasons students are reluctant to choose some aspect of the medical field as a profession, the current problem in health care will continue to perpetuate itself.

Rationale

Health care not only in the United States but the world is becoming increasingly strained as an entire population of citizens grows older. According to the United States Census Bureau (2003), there are over 35 million people in the United States over the age of 65. By the year 2030, 26% of the U.S. population will be aged 65 older; subsequently, the demand for health care services will increase during this time. There are other population structures that are more "aged" than America's. In Sweden and Japan nearly 17% of their population is currently over the age of 65. As our society grows more mature, the American health system will undoubtedly suffer from a decreasing ratio of health care workers to those needing aid. Health care workforce is crucial to the delivery of critical care to those experiencing acute or long-term care. Persistent nationwide shortages of physicians, nurses, and health care professionals of all types already have taken a toll on the present overall health care system.

This shortage of health care professionals includes registered nurses, clinical laboratory technicians, medical doctors, occupational therapists, physical therapists,

respiratory therapists, and pharmacists. Registered nurses are the single largest group of health care workers in this country (State of the Health Care workforce, 2000). Yet, it has become disturbingly clear that not only the United States but the world faces an uncertain future about the adequacy of its nursing workforce and in some other areas of allied health (Berryman, 2001). A report from the U.S. Department of Health and Human Services entitled "Projected Supply, Demand, and Shortages of Registered Nurses 2000-2020," predicted the 2000 national shortage of 6% will double by 2010, and will be at 20% by 2015 and 29% by 2020. Conversely, according to a survey conducted by the American Physical Therapy Association (Goldstein, 2001) there is essentially full employment of physical therapists who desire full-time work. Results of this survey showed the unemployment rate for physical therapists was only 1.1%; that is, only 1.1% of physical therapists were out of work and looking for work in the field. This was the lowest unemployment rate recorded during the four previous years.

In addition to shortages of registered nurses, data collected by the Tennessee Hospital Association (THA) demonstrated existing workforce shortages for other health care professionals. Specifically, there are critical shortages in some states in licensed practical nurses (LPN), radiological technologists, surgical technologists, and pharmacists, physical therapists, and occupational therapists. According to Occupational Employment Projections from the U.S. Bureau of Labor Statistics, half of the 30 fastest growing jobs in the nation during this decade will be in allied health (Berryman, 2002).

Another declining population is anatomy educators. There currently exists a shortage of qualified faculty to teach anatomy in the United States medical schools (McCuskey, Carmichael, & Kirch, 2006). This shortage is in part due to a period of

changes in the training of anatomists during the 1960's and 1970's. There was a period in the 1960's and early 1970's that the National Institute of Health (NIH) funded training grants that funded students who wished to engage in anatomical education. Then questions began to rise regarding the large time commitment that anatomy curriculum required. It was during this time emphasis was being placed on expanding research and grants were being awarded to expand educational research infrastructure. As a result, many faculty members perceived that research productivity was emphasized and teaching contributions were minimal, especially when tenure was an issue. This has led to the current crisis that leaders in the field of gross anatomy perceive as critical shortage of qualified faculty willing to teach human gross anatomy.

Ironically, at a time when our society needs more health care professionals there is a national shortage of anatomy educators. A deepening shortage of experienced faculty members willing to teach gross anatomy to medical, dental, and other allied health students has developed. In a 2002 survey, the American Association of Anatomists (AAA) and the Association of Anatomy, Cell Biology, and Neruobiology Chairpersons (AACBNC) found more that 80% of the chairs of departments responsible for teaching anatomy anticipated having "great" or "moderate" difficulty recruiting qualified faculty to teach human anatomy.

At the heart of this debate is the need to educate more people in the medical profession and increase the number of faculty teaching human anatomy. Evidentiary support for this lies in statistics in fields of physicians, nursing, physical therapy, occupational therapy, physician's assistants, and other related allied health professions. Allied Health Schools are experiencing declining enrollments in nursing, occupational

therapy, respiratory therapy, and pharmacy. Some of the decrease is due to more professional opportunities for women while other reasons exist such as the need to recruit students into these professions. These occupational shortages represent employment opportunities for future students. But with these opportunities comes challenges from educators who teach anatomy at both the graduate and undergraduate levels. Increasing the numbers of professionals is only beneficial if those being educated are adequately prepared to deliver health care that is based on fundamental knowledge of these professions.

Human anatomy forms the foundation and basis of all health care professions. From the molecular to the macroscopic, anatomy provides a unique and necessary perspective of the human body. Because is it is a requirement for programs of study in health sciences, a basic science course such as anatomy can assume an unplanned "gatekeeper" function to professional advancement. "Knowledge of the structure of the human body from what can be seen with the unaided eye (gross anatomy) is fundamental to understanding bodily function and how both structure and function are modified by disease" (McCuskey, Carmichael, & Kirch, 2006, p. 429). The academic content of anatomy is comprehensive and students often view it with anxiety and apprehension due to the amount of detailed knowledge needed to successfully complete the course. And because the material is necessary for a base of knowledge in the medical field, students may perceive the course as a deterrent to their intended career goal. Undeniably, a solid foundation in anatomy is the best preparation for a successful career in the medical field and allied health professions.

Students taking anatomy have a wide range of educational and profession goals, and professional programs vary in their anatomy grade requirements for admission. Most nursing programs require a minimum of a "C" in human anatomy, while medical schools usually require a "B" or better. Physical therapy and occupational therapy programs vary in their requirements, but the majority requires a "B" or better in anatomy to be accepted as a future student in that field. Due to the comprehensive nature of the discipline, students may not achieve the grade they need to continue with their course of study. Some students retake the course and receive a higher grade; however, others may change their professional goals or drop out of higher education completely. The effects of attrition are problematic at many levels especially in health care professions where workforce shortages exist. A student in a health care pre-professional curriculum who decides to drop out will be one less employee practicing in the clinical setting in a few years. Yet, there is a clear argument about priorities in teaching anatomy and about the importance of learning fundamental concepts necessary for competent practice. Moreover; prerequisite science courses during a student's undergraduate education are considered essential not only in determining one's ability to do well in similar higher-level courses but also to ground an undergraduate student in basic elementary scientific concepts and principles.

Therefore the issue of the importance of succeeding in anatomy is paramount in increasing qualified health care professionals and health care educators. If we as a society do not address this problem, we as a nation run the risk of producing a generation that does not have the necessary number of health professionals – surgeons, radiologists,

dentists, physical therapists, and others – and whose knowledge of human structure and function is limited and not adequate.

Reasons for academic success in college have been studied by a multitude of researchers almost from the conception of undergraduate education in the United States. Demographic characteristics and psychological characteristics have been exhaustively examined to better understand what contributes to students succeeding or failing in their pursuit of gaining a degree from a higher education institution. Specific academic disciplines have been researched to help determine what role demographic and psychological characteristics play in the successful achievement of the given course of study. From the previous research, educators are better informed as to why or why not students may perceive their course as difficult before the first exam is ever given. However, there exist few studies that examine these constructs and the discipline of human anatomy.

One such psychological factor that has been examined in relation to the academic arena is self-efficacy. Self-efficacy, sometimes referred to as perceived ability, refers to the confidence people have in their abilities to successfully perform a particular task (Bandura, 1997). Bandura's (1977) social learning theory has been used to help predict academic outcome in disciplines such as chemistry (Smist, 1993); mathematics (Olsen & House, 1997); and physics (Fenci & Scheel, 2005). Through these and other studies, researchers have hoped to determine what activities individuals will pursue, the effort they expend in pursuing those activities, and how long they will persist in the face of obstacles. The reason this knowledge is so important is because there exists an assumption that the cognitions that individuals create and develop and hold to be true about themselves form

the very foundation of human agency which are vital forces in their success or failure in all endeavors including school (Pajares, 1994).

Increasing student self-efficacy for academic tasks in anatomy is integral to pursuing avenues that could help more students succeed, thus yielding more qualified students to help fill the void in the professions discussed earlier. Self-efficacy has been shown to hold greater explanatory and predictive power for academic outcomes than many other determinants (Pajares & Miller, 1994; Zimmerman, Bandura, & Martinez-Pons, 1992). When academic self-efficacy is formed is debatable, but many researchers theorize this psychological characteristic is generally formed during the high school years. The types of courses taken in high school and how students perform in these courses can impact acceptance into college, choice of college major, and subsequent career choice (Kramarae, 2001). Confidence is strongly correlated with which students continue in math and science courses and which do not (Jewett, 1996). In essence, "….efficacy beliefs partly shape the courses that lives take" (Bandura, 1997, p. 239). A student's level of self-efficacy is influenced by past successes and failures, which can then subsequently impact future successes or failures such as grades.

The second psychological characteristic that will be an integral part of this study is outcome expectations, for they too are likely to influence behavior. Outcome expectancy is a persons' estimate that a certain behavior will produce a resulting outcome. Unlike self-efficacy, outcome expectancy is more of a belief about the consequences of a behavior. It should be made clear that self-efficacy and outcome expectancy are two totally different constructs. Outcome expectancy gives a hint of what a student expects to make in a specific academic course. Self-efficacy is the student's conviction in their

ability to execute a behavior that will result in a desired outcome (Bandura, 1997). According to Hackett and Betz (1981), outcome expectation is a belief about the consequences of a behavior as opposed to efficacy expectation, which is a belief concerning the performance of a behavior.

Students' expectancies of their academic performance have also been found to be significant predictors of college grade performance (House, 1997). Achievement expectancies have shown to predict grades in general education courses (House, 1997), general exam scores (Holen & Newhouse, 1976), and overall grade performance (House, 1993). In addition, Pajares (1996) found a significant relationship between grade expectancy and grade outcome after controlling for variables such as prior achievement and self-efficacy.

Evidence exists that there is a present shortage in some medical and allied health fields, and predictions for the future see this problem multiplying. This dilemma needs to be addressed in order to help ensure there is adequate health care in the year 2020. Therefore, to increase the number of health care professionals more students need to successfully complete undergraduate prerequisite courses including the capstone course of human anatomy. By identifying those students who may enter the course with preconceived opinions about their own ability and with low expectations, college instructors could help dispel this negativity and increase the numbers of students successfully completing the course. Furthermore, it is critical to study the demographics of students enrolled in a college-level human anatomy course and to determine if these characteristics and/or their self-efficacy and academic outcome expectancy can predict their final grade in the course. The results of this study are important to federal agencies

such as United States Department of Health and Human Services, as well as state Departments of Health and Hospitals. Additionally, medical and allied health professional schools could use this information to help find funding for additional courses if there was a larger pool of qualified students who were identified as having low self-efficacy. And university faculty who teach courses in anatomy will find the results of this study useful in identifying early those students who may struggle with the amount and content of the material. Further research could help explore ways to help these students succeed not only in class but possibly in their career goals.

Purpose of Study

The purpose of this study is to determine the influence of selected demographic and psychological characteristics on the academic achievement of students enrolled in an undergraduate human anatomy course at a research-extensive university in the Southern region of the United States.

Dependent Variable

The dependent variable in this study is academic achievement of students enrolled in a human anatomy course (as measured by the final grade received in the human anatomy course) at a research-extensive university in the Southern region of the United States.

Specific Objectives

The following specific objectives were formulated to guide this research:

1. To describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at a research-extensive university in the

Southern region of the United States on the following demographic and academic characteristics:

(a) Gender;

(b) University Classification;

(c) Declared University Major;

(d) Race;

(e) Father's Level of Education;

(f) Mother's Level of Education;

(g) High School Science Grade Point Average;

(h) High School Grade Point Average;

(i) College Grade Point Average.

2. To describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States on the following selected psychological characteristics:

(a) Self-Efficacy;

(b) Outcome Expectancy as measured by:

1. Likelihood of meeting learning outcomes

2. Value placed on learning outcomes.

3. To determine if a relationship exists between self-efficacy and outcome expectancy among students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States.

4. To determine if a relationship exists between the following specific psychological characteristics and academic achievement (as measured by final grade received in a human anatomy course) in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Self-Efficacy and Final Grades;

(b) Outcome Expectancy and Final Grades as measured by:

1. Likelihood of meeting learning outcomes

2. Value placed on learning outcomes.

5. To determine if a relationship exists between the following selected demographic characteristics and academic achievement of students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Gender;

(b) University Classification;

(c) Declared University Major;

(d) Race;

(e) Father's Level of Education;

(f) Mother's Level of Education;

(g) High School Science Grade Point Average;

(h) High School Grade Point Average;

(i) College Grade Point Average.

6. To determine if a model exists that significantly increases the researcher's ability to accurately explain the variance in academic achievement (as measured by final grade

received in a human anatomy course) from the following psychological and demographic characteristics of students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Self-Efficacy;

(b) Outcome Expectancy as measured by:

1. Likelihood of meeting learning objectives

2. Value placed on learning outcomes;

(c) Gender;

(d) University Classification;

(e) Declared University Major;

(f) Race;

(g) Father's Level of Education;

(h) Mother's Level of Education;

(i) High School Science Grade Point Average;

(j) High School Grade Point Average;

(k) College Grade Point Average.

Definition of Terms

For the purpose of this study, the following terms are operationally defined to assist in the interpretations of the study:

1. Race – As self-indicated by students from the following: African American, Asian-American, Anglo-American, Native American, and Hispanic American.

2. Marital Status – as indicated by students from the following: Single, Married, Other.
3. Mother's Level of Education – as indicated by students from the following: None, 1-4, 5-8, 9-12 but didn't graduate, High School Diploma, Some Years of College, College Diploma, Some Graduate School, Graduate or Professional Degree.
4. Father's Level of Education – as indicated by students from the following: None, 1-4, 5-8, 9-12 but didn't graduate, High School Diploma, Some Years of College, College Diploma, Some Graduate School, Graduate of Professional Degree.
5. High School Grade Point Average – as indicated by students from the following: 2.0 - 2.5, 2.51 - 3.0, 3.1 - 3.5, 3.51 - 4.0.
6. College Grade Point Average – as indicated by students from the following: 2.0 – 2.5, 2.51 – 3.0, 3.1 – 3.5, 3.51 – 4.0.
7. High School Science Grade Point Average as indicated by students from the following: 2.0 – 2.5, 2.51 – 3.0, 3.1 – 3.5, 3.51 – 4.0.
8. Human Anatomy – as defined by the Louisiana State University General Catalog (2006): Micro and macroscopic study of the human body.
9. Self-Efficacy – as defined by Bandura (1977): perceived ability, refers to the confidence people have in their abilities that they can successfully perform a particular task.
10. Outcome Expectancy – as defined by Eccles et al. (1983): a person's estimate that a certain behavior will produce a resulting outcome.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Introduction

Over the past 30 to 40 years, higher education in the United States has seen a shift from elite to mass education. Because of national educational reform there is more equity and access to higher education. Accompanying this growth in higher education is an increasing diversity amongst student populations. Students from different social and cultural backgrounds, with varied life experiences, and diverse levels of education bring with them varied needs and academic potential. College students are more diverse today than at any other time in history.

Many believe that success in higher education is not only essential to furthering one's own education but also ensures a more educated and productive society. Therefore, there has been a continuing interest in the identification of effective predictors of academic achievement in higher education. For almost 100 years, there has been research done on the prediction of college grades. Most of the early research focused on the use of ability measures and high school performance measures to predict college grades (Fishman & Pasanella, 1960; Odell, 1929).

Early educational psychologists played a major role in society's belief system about academic success and failure. In James' (1950) *Principles of Psychology*, his longest chapter in the two volume series was "The Consciousness of Self." James was one of the first writers to use the word ***self-esteem,*** which he described as a feeling that "in this world depends entirely on what we back ourselves to be and do." But following James were psychologists such as Watson, Pavlov, and Skinner who espoused to

observable stimuli and response as keys to academic success or failure and paid little attention to the self. It was no coincidence that when psychology abandoned the self, so to did education (Ozmon & Craver, 2003).

During the 1950's, the Humanistic movement evolved, moving in concert with existentialism and phenomenology. Previous to this, attitudes of educational psychologists had been a more narrow and passive view of human functioning. Gradually they began to embrace and shift their focus on inner experiences, internal processes, and self-constructs (Pajares, 1996). One of the more vocal of these theorists was Maslow with his theory of a motivational process by which there was a human desire to fulfill certain needs (Ozmon & Craver, 2003). While fulfilling these needs, Maslow suggested that people would become self-actualized thus achieving their potentialities, capacities, and talents.

Ten to 20 years later a renaissance occurred that placed an interest in internal and intrinsic motivating forces especially in reference to the self. From this educators and psychologists began to promote the importance of a healthy self-concept and positive self-esteem. Nationally, efforts began by local and federal governments to promote self-esteem in children. In theory this appeared well-intended, but this surge of interest was misguided and did little to reach the goal of improving the self-esteem of children or adults. In part, this was due to the lack of research evaluating the relationship between self-esteem and academic achievement. Results were confusing and inconclusive (Pajares, 1992). Hansford and Hattie (1982) studied the correlation of self-concept to academic achievement and found this to be inconclusive with the correlation -.77 to .96.

Still there remains controversy about self-esteem and the building of healthy self-perceptions, especially with regard to academic performance. Emerging as one of the most

prominent voices calling for a new perspective on self-beliefs has been Bandura (1986, 1997). In his book, *Self-efficacy: Toward a Unifying Theory of Behavioral Change*, he identified the ability of individuals to create and develop self-perceptions of capability that ultimately play a major role in personal goal-setting and the control they are able to exercise over their own environments. By explaining that human behavior is an interaction between this exercise and external sources of influence, Bandura pointed out the critical elements of motivation and belief in one's self. How people behave can be predicted by the beliefs they hold regarding their own capabilities more than by what they are actually capable of achieving, and Bandura defined this as "self-efficacy" (Bandura, 1977).

Definition and Description of Self-Efficacy

According to Bandura (1997), one's belief set is a major mediator of behavior and behavioral change. If a person believes that he does not approach a task with belief that it will be successful then he is more likely to be unsuccessful. When a person possesses a low self-efficacy expectation with regard to a specific behavior or behavioral domain, this expectation will lead to avoidance of those behaviors. In lieu of avoidance, when there is an increase in self-efficacy expectations, there will be an increase in the frequency of behavior. This behavior is cyclical and increases the students' chance of failure. With a better understanding of self-efficacy beliefs, there can be a better understanding and predictability of behavior.

Sources of Self-Efficacy

Bandura (1997) identified four sources from which self-efficacy is developed; mastery, vicarious experience, social persuasions, and physiological states. An

examination of each source helps to explain how the sources affect self-efficacy, thereby affecting human behavior.

Mastery Experience

Of the four sources, mastery experience is the most influential of the self-efficacy beliefs (Bandura, 1997). Simply put, success raises self-efficacy, and failure lowers it. Betz and Hackett (1981) found students who perform well on math tests and receive high grades in math classes are more likely to develop a strong self-confidence in their academic ability in math. With this confidence, high achieving math students are more likely to continue enrolling in math-related classes, approach math tasks with more positive attitudes, and be more willing to exert an effort should difficulty in this academic area arise.

Conversely, students that score low on math tests and make poor grades in math have less confidence in their math abilities. This scenario is more likely to result in these students avoiding advanced math classes, and exposure to math-related academics causes apprehension. Because mastery experiences are the most influential source of self-efficacy this fact has important implications for self-enhancement as it relates to academic achievement (Pajares, 1996). If mastery experience has this much influence on a student's academic success or failure, educators need to recognize the importance of mastery experience and put forth efforts that focus on raising students' feeling of competence.

Social cognitive theorists advocate helping students gain confidence through interventions designed to result in accomplishment. But these theorists emphasize the need for the students to be recognized and awarded for accomplishments that the students feel are important to their culture.

Vicarious Experience

Although a weaker influence than mastery experience, vicarious experience plays an important role in academic self-efficacy. When students are uncertain about their academic ability in an area or have not had much exposure to a certain academic area they likely will be sensitive to the academic information (Choi, 2005). Having someone significant to the student believe and encourage the student's academic efforts often has positive results. This influence may come from a teacher serving as a role model or a peer serving in the same capacity (Griffin & Griffin, 1998). Peer tutoring offers students an opportunity to learn vicariously through others, sometimes resulting in enhanced self-esteem (Johnson, Johnson, Pierson, & Lyons, 1985).

Social Persuasion

Persuasion can come in the form of positive and negative effects on academic achievement. Positive persuasion works to encourage and empower while negative persuasion may sometimes weaken a student's self-belief, thus affecting their self-efficacy in a specific academic subject. Unfortunately it is harder to strengthen a student's belief through praise and encouragement than to deflate a student's self-efficacy value through negative appraisals (Pajares, 1996).

Physiological States

Academic achievement is sensitive to stress, anxiety, fatigue, arousal - any mood altering aura that may cause a change in the ability to comprehend. Self-efficacy influences physiological states thus affecting academic achievement (Bandura, 1997). When negative physiological states exist, although the student may possibly be unaware of the negativity, it can provide cues to the student something is amiss (Pajares, 1996). In

addition, strong emotional response to academic tasks may occur when success or failure is anticipated.

Assigning Self-Efficacy

The construct of self-efficacy has been tested in varied disciplines and settings and has received support from a diverse number of fields of study (Maddux & Stanley, 1986). For example, self-efficacy has been examined as a predictor of academic success and failure in higher education academic disciplines such as physics (Fenci & Scheel, 2005); statistics (Finney & Schraw, 2003); chemistry (Smist, 1993); mathematics (Olsen & House, 1997); and anatomy and physiology (Witt-Rose, 2003). Additionally, a considerable volume of studies has demonstrated that self-efficacy is both an important determinant and a consequence of physical activity (McAuley & Blissmer, 2000). Additionally, there is evidence that self-efficacy predicts such diverse outcomes as social skills, smoking cessation, pain tolerance, athletic performance, career choices, assertiveness, coping with feared events, recovery from heart attack, and sales performance (Bandura, 1986).

Self-efficacy in Academics

One of the most heuristic and useful practices in the study of education has been the application of self-efficacy theory (Betz & Voyten, 1997). Pajares (2003) found a large body of research on the influence of students' self-beliefs and principles of academic motivation, and his work stands as one of the most comprehensive bodies of research in the field of motivation. His research focused on a review of literature related to self-efficacy beliefs, motivation, and achievement related to writing. Pajares' review of literature cited Graham and Weiner's (1996) study on self-efficacy that showed self-

efficacy emerged as a better predictor of behavioral outcomes than self-beliefs. Although Pajares' work focused on writing and outcomes related to writing, he concluded that the findings could be generalized to other areas of study (Pajares, 2003). In previous work, Pajares (1996) reported self-efficacy to be a strong predictor of college student performance. And more recently, Gore's (2006) findings suggested that academic self-efficacy beliefs can be used to predict college students' academic performance and persistence. But he pointed out that as a predictor it may partially be dependent upon (a) when self-efficacy beliefs are measured, (b) what aspect of self-efficacy is being measured, and (c) what college outcome one wishes to predict.

Research has demonstrated that interest in a task, thinking that a task is important, and feeling excited about it, lead to an increase in student engagement and learning (Linnenbrink & Pintrich, 2003). In their work, Linnenbrink and Pintrich made a strong point to differentiate the notion of self-esteem from self-efficacy. One's self-esteem is related to emotional reactions to accomplishments, whereas self-efficacy is related to a belief in one's ability or skill set. Johnston (2006) explained one's self-esteem is related to emotional reactions to accomplishments, whereas self-efficacy is related to a belief in one's ability or skill set. Bandura (1977) also distinguished self-efficacy from self-esteem by noting there is no well-established relationship between beliefs about one's abilities (self-efficacy) and whether one likes or dislikes oneself (self-esteem). This belief is regarding a specific and situational judgment of capabilities (Linnenbrink & Pintrich, 2003). Researchers are better able to measure an individual's actual level of engagement and learning when they separate out general competence or self-concept beliefs. By

placing this focus on self-efficacy, researchers can better predict the learners' outcome (Linnenbrink & Pintrich, 2003; Pajares & Miller, 1994).

To fully understand how these two constructs function as psychological processes, it is critical that they be validly measured. For example, measures of self-efficacy should accurately reflect the task or behavior of interest (Gore, 2006). Similarly, as self-esteem is both a multidimensional and a hierarchical construct it should be measured at the global, domain, and sub domain levels (Marsh, 2001). However, in some instances, the task-specific measures of efficacy are also significantly correlated with the esteem measures (Hu, McAuley, & Elavsky, 2005).

The construct of learned helplessness is related to self-efficacy; within self-efficacy theory the concept is referred to as low outcome expectation. (Linnenbrink & Pintrich, 2003; Pintrich & Schunk, 1996). When students believe there is no relationship between how hard they study and their resulting performance in school, learned helplessness is present. Research continues to demonstrate that students who test high in learned helplessness are less likely to persist at tasks, thus experiencing a continued decline in performance (Linnenbrink & Pintrich, 2003; Pintrich & Schunk, 1996). Therefore; it is predictable to expect that students who have low academic self-efficacy are less likely to seek help, and this is supported in research (Karabenick & Knapp, 1991; Linnenbrink & Pintrich, 2003; Newman, 1990; Ryan & Pintrich, 1997). Conversely, students with high levels of self-efficacy are more likely to seek help, persist, and try. According to Pintrich and Schunk (1996), the generalization of self-efficacy is stable among different student ages, including elementary, junior high, high school, and college; this generalization continues across gender and ethnic group differences. Self-efficacy is

related to a careful estimation of one's abilities, and overall self-efficacy beliefs should be slightly higher than actual skill level, but not so high that a student overestimates their actual level of knowledge (Bandura, 1997; Linnenbrink & Pintrich, 2003). According to Graham (1994), African-American students are more likely to have high perceptions of ability, which contrasts the generally low levels of achievement on tests. In a recent study, Johnston (2003) found the correlation between academic self-efficacy and grade point average was not significant for any of the ethnic groups in his study, which included African-American, Hispanics, and Caucasians.

Efficacy can influence emotions in both a positive and negative way. Students with high levels of self-efficacy can experience positive emotions related to academic settings just as those with low levels can experience negative emotions like anxiety and even depression (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Linnenbrink & Pintrich, 2003; Meece, Wigfield, & Eccles, 1990; Pintrich & DeGroot, 1990; Wright & Mischel, 1992).

Academic Self-Efficacy as a Predictor in Science

Bandura's (1997) self-efficacy theory represents one of the most visible and flourishing areas of research in academia. Self-efficacy expectations, beliefs concerning one's competence in specific behavioral domains, are postulated to influence choices of performance in, and persistence in areas of endeavor requiring or utilizing those behavioral competencies. One type of self-efficacy that has received much attention is self-efficacy in the academic areas of math and science. This domain of interest has been important for two reasons. First, the subjects are directly and indirectly related to a vast array of occupational possibilities – directly by virtue of the ever-increasing number of

jobs in the scientific and technical fields (National Science Foundation, 1999), and indirectly because competence in mathematics has long been recognized as a critical filter for entry into scientific and technical fields. Second, because women and minorities continue to be poorly represented in both scientific and technical fields (National Science Foundation, 1999), the possible role of low math and scientific self-efficacy expectations in the failure to choose or persevere in the career fields has warranted research attention (Betz & Guilliam, 2001).

According to Seymour and Hewitt (1997), fewer college students are electing science as a course of study or a profession. Multiple researchers (Hudson, 1986; Mannis, et al., 1989; Tobias 1994; Treisman, 1992) have reported a variety of reasons that have dampened students' interest in science and undermined their motivation to continue. Among those reasons listed was a loss of confidence in their ability to master science. In a study by Seymour and Hewitt (1997), almost one-quarter (24.2%) of their sample reported a fall in their level of confidence caused by expectation of high (or easy) grades.

"Self-efficacy is especially important in learning difficult subjects (such as biology and other sciences) given that students enter courses with varying levels of fear and anxiety" (Baldwin, et al., 1999, p. 399). Baldwin et al. (1999) also stated that self-efficacy becomes more important over the duration of a course as science concepts increase in complexity. Kennedy (1996) reported that science self-efficacy may affect science learning, choice of science, amount of effort exerted, and persistence in science.

In 1998 Andrew investigated the hypothesis that self-efficacy was a predictor of academic performance in science of first-year nursing students. Results showed that 70% of students' self-efficacy for science could be explained by six factors on an instrument

designed specifically to measure self-efficacy. The results of this study are congruent with Bandura's (1977, 1986) theory that utilization of self-efficacy seems to be a particularly salient means of measuring students' expectations about science, particularly as personal judgments will ultimately influence their motivation and academic performance in this subject area.

Other researchers that have found a relationship between self-efficacy and science achievement include DeBacker and Nelson (1999, 2000); Pintrich and DeGroot (1990); Smist (1993); and Witt-Rose (2003). A study in 1986 by Lent, Brown, and Larkin found that self-efficacy contributed significantly to the prediction of science and engineering achievement. Importantly, in a similar study in 1994, Smist and Owen pointed out that Lent's results were possibly somewhat limited due to the limited number of females in the study and in the field of science overall during that time period. But a more recent study found students' enrolled in an Anatomy and Physiology course at a technical college self-efficacy to be positively related to academic achievement (Witt-Rose, 2003). Results of this study showed a highly significant positive relationship between self-efficacy and midterm grades ($p<.0001$) and self-efficacy and final grades ($p < .0001$). This study failed to find significant gender differences in self-efficacy and gender as did Smist's study in 1993. But Britner and Pajares's (2001) study found that science self-efficacy was the only motivation variable to predict the science achievement of girls and boys with the independent variable accounting for 51% variance in the science grades of girls and 36% of the variance in the science grades of boys.

It is predictable to expect that students who have low academic self-efficacy are less likely to seek help, and this is supported by research (Karabernick & Knapp, 1991;

Linnenbrink & Pintrich, 2003; Newman, 1990; Ryan & Pintrich, 1997). Students with high levels of self-efficacy are more likely to seek help, persist, and try (Linnenbrink & Pintrich, 2003).

Definition and Description of Academic Outcome Expectancy

Outcome expectancy is a derivative of expectancy-value theories akin to those presented by Eccles & Jacobs (1987); Feather (1988); and Wigfield and Eccles (1992). Their expectancy-value theory links achievement performance, persistence, and choice directly to individuals' expectancy-related and task-value beliefs. In this model, expectancies and values are assumed to be positively linked to each other. Eccles et al. (1983) and Meece et al. (1990) proposed that this type of expectancy-value model choices are assumed to be influenced by both negative and positive task characteristics, and all choices are assumed to have costs associated with them precisely because one choice often eliminates other options. Consequently, the relative value and probability of success of various options are key determinants of choice.

The predictive usefulness of outcome expectancy depends largely on the degree to which it can be distinguished from self-efficacy expectancy. Although the distinction between outcome expectancy and self-efficacy expectancy is logical, the two are often confused due to differential manipulation and assessment. Manning and Wright (1983) described two major problems in differentiating self-efficacy expectancies from outcome expectancies: multiple definitions of outcome and the potential confusion of the two expectancies. Outcome expectancy is a person's estimate that a certain behavior will produce a resulting outcome. Whereas, self-efficacy is an individual's belief that a behavior can be executed in order to produce a desired outcome (Bandura, 1997).

According to Maddux, Sherer, and Rogers (1982, p. 207), "self-efficacy expectancy is a belief about one's ability to successfully perform a behavior, is independent of outcome expectancy, a belief about the likelihood of the behavior leading to a specific outcome." Efficacy and outcome expectations are postulated to influence the development both of interests and of goals, although contextual influences may also play a role (Maddux & Stanley, 1986).

The construct of outcome expectancy is an interaction of two factors:

(a) an individual's expectations of obtaining a particular outcome as a function of performing a behavior, and

(b) the extent to which the individual assigns value to the possible outcome of the behavior (Rodgers & Brawley, 1991).

Given that this interaction is conceptually in line with the theoretical foundation which highlighted the importance of incentives in influencing motivated behavior: therefore this interaction should be valued in research focusing on student motivation and academic performance.

If an educational outcome is thought to be unattainable or worthless, students will not be motivated (Bandura, 1995). For example, a student enrolled in human anatomy may believe that should he study and work hard he will graduate and attend medical school, a positive outcome expectation. However the student may lack the confidence in his ability to learn difficult material and pass with the required grade needed for admission to medical school, an example of low self-efficacy. Low self-efficacy may prevent that student from taking anatomy although the student strongly believes that successful performance would lead to a positive outcome.

Although two separate constructs, self-efficacy and outcome expectancy when in concert may produce a positive relationship (Corcoran & Rutledge, 1989; Kirsch, 1982; Williams, Anderson, & Winnet, 2005). Bandura (1997) concurred by stating, "In most social, intellectual, and physical pursuits, those who judge themselves highly efficacious will expect favorable outcomes, whereas those who expect poor performances of themselves will conjure up negative outcomes" (p. 24). However Eccles et al. (1983) stated that past empirical work has shown that children and adolescents do not distinguish between these two different levels of beliefs. "Apparently, even though these constructs can be theoretically distinguished from each other, in real-world achievement situations, they are highly related and empirically indistinguishable" (Eccles & Wigfield, 2002, p. 119).

Schunk's (1991) concept of outcome expectations mirrored Rogers and Brawley (1991) in that they all agreed that expectancy-value theory is a joint function of

(a) people's expectations of obtaining a particular outcome as a function of performing a behavior and

(b) the extent that they value those outcomes.

Therefore; even a positive expectation does not produce action if the goal is not valued. People are motivated to act if the goal is valued and believed to be attainable. Outcome expectations and value will influence, but do not guarantee motivation and learning (Schunk, 1991).

Research has shown self-efficacy and outcome expectancy are independent predictors of intentions and behavior in sport and physical activity (Dasharnais, Bouillon, & Godin, 1986; Poag-DuCharme, 1993; Rogers & Brawley, 1993). Landry (2003) found

college students' self-efficacy to be significantly related to their capabilities to persist in college and their levels of intention certainty. She also found a strong positive correlation between college students' expectancy outcome and their belief that obtaining a bachelor's degree would enable them to achieve future goals and experience. Few studies investigating self-efficacy and outcome expectancy simultaneously in the discipline of human anatomy or even the broader discipline of science exist in the review of literature. As a single predictor, outcome-expectancy theory has been researched in various domains including science.

Outcome-Expectancy as a Predictor in Science

Nested within outcome-expectancy is expectancy-value theory which together in the academic realm defines the amount of motivation an individual is governed by the expectancy of obtaining a specified goal, and the value the individual places on that goal (Atkinson, 1964). Eccles (1987) used this approach in research on gender differences in mathematics achievement, arguing that academic choices are determined by the joint effects of a student's expectation of success in specific courses and occupations, and the subjective value placed on such achievement.

A myriad of factors influence the development of individual's expectancies and values related to academic achievement domains. Certain cultural contexts convey information to children about gender and racial stereotypes, and how these pertain to academic subject matter (Sullins, 1995). Beliefs and values held by socializing agents such as parents and teachers are transmitted to children both directly and indirectly. When a child's actual aptitude and early achievement-related experiences overlap, the child develops complex cognitive networks that link together elements of their own self-

schema, self-perceptions of their abilities, perceptions of other's beliefs about them, short and long-term goals, and beliefs about relevant task demands and costs. Combined together all these influences result in a subjective value the individual places on a particular outcome as well as the personal expectation of successfully attaining the outcome.

Prior to 1995 most of the research approaches to study expectancy-value theory had been done in the setting of K-12 educational programs or in liberal arts higher education settings. It was Sullins' (1995) work that focused on comprehensive universities, for she contended comprehensive universities educate the largest number of students in the United States. In addition her reasoning for choosing a university setting for her research was to expand previous research and to develop a more comprehensive understanding of academic communities. Results of this study found the expectancy-value theory successfully predicted not only academic achievements but also future career intentions by being able to predict if college students would continue enrolling in science courses. More importantly, Sullins (1995) used the discipline of biology to test her theory, which stepped out of the academic domains of previously used academic subjects.

In expectancy-value models, goals are seen as broad and distal influences that impact achievement behaviors indirectly through values and expectancies. In Eccles' et al. 1993 study, she identified four aspects of valuing of science using the expectancy-value model. Those four were (1) utility value which is a measure of valuing science for its usefulness in the future; (2) attainment value which is a measure of how important it is to an individual to master science concepts and do well in science courses; (3) cost is operationalized as the worthwhileness of time and effort required for learning science; and

(4) intrinsic value or the measure of how much one finds enjoyment from the doing of an activity. DeBacker and Nelson (1999) used this model to explore how three science outcome measures related: effort, persistence in science learning, and science achievement. The results were consistent with earlier studies in that the more value a student placed on the learning outcomes the more likely they are to successfully complete the course. What emerged from this research is that of the four components of their expectancy-value model the most critical is cost. Cost is conceptualized in terms of negative aspects of engaging in the task, such as performance anxiety and fear of both failure and success, as well as the amount of effort needed to succeed and the lost opportunities that result from making one choice rather than another.

These two studies, with others by Feather (1988), Wigfield and Eccles, (1992, 2001), are based in Atkinson's (1964) expectancy-value model in that they link academic achievement performance, persistence, and choice most directly to individuals' expectancy-related and task-value beliefs. However, they differ from Atkinson's expectancy-value theory in several ways. First, both the expectancy and value components are more elaborate and are linked to a broader array of psychological and social/cultural determinants. Second, expectancies and values are assumed to be positively related to each other, rather than inversely related, as proposed by Atkinson.

Conceptual Similarities/Differences

In the expectancy-value model of achievement a distinction is made conceptually between beliefs about ability and expectancies for success. In this model, beliefs about ability engage in the present ability whereas expectancies focus on the future. Empirically these two beliefs show strong positive correlation and usually are measured within a

specific domain forming a single factor known as expectancy-related beliefs (Eccles et al. 1993; Eccles & Wigfield, 1995). When comparing self-efficacy to expectancy-value there are similarities. Both self-efficacy and beliefs about one's own ability are personal viewpoints about one's perceived ability. Additionally self-efficacy is similar to expectancies for success in that they both focus on future-oriented beliefs whether long-term or short-term (Gao, 2006). Placing these constructs in the academic realm helps to differentiate the two by defining self-efficacy judgments as more task and situation-specific and is made in reference to some type of goal (Bandura, 1986; Pintrich & Schunk, 1996). Expectancy-related beliefs refer to a belief in one's ability in a sub-domain such as academics, physical activity, and social settings.

The usefulness of the self-efficacy and outcome expectancy theories as a predictive utility depends largely on the ability to distinguish between the two. Previous research has compounded the problem of separating the two constructs (Bandura, 1986, Maddux, 1993; Manning & Wright, 1983) by not making a clear, although logical, difference between the two. Manning and Wright (1983) used hierarchical multiple regression and found self-efficacy to be a more powerful predictor of behavior than outcome expectancy. However, Maddux, Sherer, and Rogers (1982) used a two-by- two-by-two factorial design and found these two constructs to be equally good predictors of behavioral intentions. It is critical that the two be defined as two totally separate constructs in order to be linked to predicting academic outcome.

Yet another issue is the similarity between expectancy for success and outcome expectancy. Although both involve the anticipated outcome of engaging in a task, expectancy for success is the belief that there is a probability of a successful outcome. On

the other hand, outcome expectancy engages in an anticipated outcome that is the result of motivated behavior. Helping to provide more clarification, Wigfield and Eccles (2000) measured individual expectancies for success but not outcome expectancy within Bandura's (1997) self-efficacy theory. By doing so, outcome expectancy shows more of a propensity to provide incentives for outcomes and serves the same function as task values in expectancy-value model.

Logically it appears that value plays an important role in both task and outcome related theory. The amount of motivation to engage in an academic task is based on the individual's value system of the task (task values) or the outcome (outcome values). Wigfield (1994) defined task values as "the incentives or purpose that individuals have for succeeding on a given task" (p. 102). Academically, an individual's task values have to do with perceived beliefs about interest, importance, and the usefulness of a specific subject. But outcome values show differences from individual to individual due to the value placed on certain outcomes. There does appear to be a correlation between subjective value and individual task, but possibly an individual values an academic task based on the value of the outcome of the task. A number of studies support the influence of perceived value has on academic success. For example, Ratcliff (1991) found that student attitudes about going to college coupled with the value placed on a college education has a direct influence on academic achievement.

What these two theoretical constructs have in common are beliefs about one's perceived capability and the incentives present to motivate the individual to participate. Relevant research in academia has helped to explain student academic motivation and achievement. Few researchers have delved into using both self-efficacy and outcome

expectancy in the field of science. Comparisons between self-efficacy and academic self-concept in an academic setting were done by Bong and Clark (1999), with self-efficacy emerging as the easier of the two constructs to define and measure. Also Landry (2000) examined the correlations between self-efficacy, motivation, and outcome expectancy, but the focus of her study was based on retention of college students.

Gender, Academic Self-efficacy, and Outcome Expectancy

Federal laws dating back as far as the 19th century designated equal educational opportunity for both males and females; however, women continued to perceive their place was in the home and not in secondary schools, colleges, or professions (Kite, 2001). Eventually women's academies began to provide women with secondary and college-level instruction and women began to educationally engage. Due to the demand of teachers in the early 20th century, large numbers of women were encouraged to participate in higher education. With the passage of the Civil Rights Act of 1964 and Title IX Education Amendments of 1972 (U.S. Department of Labor, n.d.), women's rights movements gained momentum and power. These two laws prohibited gender discrimination in educational institutions receiving federal aid. The effectiveness of these two laws is evident in data reported by the National Center for Education Statistics (NCES, 2002) which indicated that between 1969 and 1999 the number of undergraduate women increased by 156% compared to a 37% increase in men.

Even with these advances in women's participation in higher education there has been a continued effort to increase the participation of women in high-status fields involving mathematics and science, and women remain less likely than men to pursue a college education in such fields (National Science Foundation, 2000). Incidentally, there

has been an increase of women indicating greater interest in some areas such as the life sciences (Bleeker & Jacobs, 2004). Science courses hold a prominent place in the academic curriculum for medical fields, and academic success in these courses is especially imperative in this age of rapid scientific and technological progress in health care.

The projected shortfall of medical personnel in the United States has influenced many research studies about the achievement and participation of women majoring in life sciences and then finding employment in allied health fields. Many propose that if the number of women committed to medical professions does not increase the nation will be unable to meet its technical and scientific needs (National Science Board, 1986). To promote participation of women in science, researchers and educators turned their attention to the reasons why the under-representation and how could the trend be changed. The National Science Education Standards directly called for greater participation of women in science (National Research Council, 1996), yet the shortage of female science professionals remains profound.

Gender has long been described as a potential moderating factor in levels of academic self-efficacy and more specifically science. The relationship between gender and self-efficacy has been a focus of numerous studies (DeBacker & Nelson, 1999, 2000; Pajares & Miller, 1994; Pintrich & DeGroot, 1990). Smist, Archambault, and Owen (1997) documented that females have a lower level of self-efficacy in the disciplines of math and science when compared to their male peers. Some suggested this low level of self-efficacy in science begins as early as seventh grade for some females (Sadker & Sadker, 1995). Kahle and Meece (1994) found that the gender differences in science self-

efficacy are relatively small in elementary grades but increase in later grades. As these gender differences emerge in middle school they tend to become solidified by the time students reach their senior year in high school (American Association of University Women, 1992; Linn & Hyde, 1989, Oakes, 1990).

The discrepancy in numbers of males and females in the discipline of science some have attributed to (a) innate differences in visual-spatial abilities; (b) differential socialization experiences at home and at school; (c) gender-role stereotypes; and (d) differences in boys' and girls' participation in science within and outside of school (Jones & Wheatley, 1989; Kahle & Meece, 1994; Linn & Hyde, 1989). In a study by Meece and Jones (1990) they examined levels of confidence in fifth-and sixth-grade students enrolled in a science class. The results revealed that boys rated their confidence higher than did girls. However standardized tests revealed no gender differences in students' scores, suggesting that Meece and Jones' findings most likely reflected a sex-typing bias. Bandura (1986, 1997) proposed girls' capabilities in science are undermined by sex-role stereotypes in our culture, which intimidates females more so than their male counterparts. According to Kahle and Meece (1994), the gender effect is manifested when expectations, interactions, or measured achievements (i.e. grades) are related to a student's sex rather than based upon her or his potential. Because of this relationship, girl's attitudes toward science, their self-confidence in performing scientific tasks, their achievement levels in science, and their motivation to continue to study science are all influenced by the gender effect. Although Ely (1995) suggested that gender identity is an ongoing socially constructed phenomenon that implies that gender identity is malleable on the basis of changes in social milieu.

What seems to surface the most as the reason that gender differences do exist in the study of science is that gender is influenced by sociopsychological characteristics. According to Tobias (1993), women are socialized in ways that do not allow them to develop personal characteristics and interests that promote the successful pursuit of scientific careers. This tendency is reflected in Sullin's (1995) work in which it was pointed out that women's persistence rates are significantly lower than those of their male peers in the area of college science. This picture is somewhat puzzling given that there exists some evidence that women entering science majors have higher average performance scores than their male counterparts (McLelland, 1992). It appears that well-prepared, able women are lost from undergraduate science because of decreasing confidence in their ability to do science and the onset of depression about their academic progress. Bandura (1997) has suggested that when social constraints and inadequate resources impede academic performance, self-efficacy may exceed actual performance, not because students do not know what to do, but because they are unable to do what they know.

In a 2004 study investigating differences and shifts in learning and motivation constructs among male and female students in a college physics course, Cavallo and Potter found significant higher self-efficacy in males than in females. The findings of this study also showed male students had significantly higher performance goals and physics understanding compared to females and persisted throughout the year-long course. Sullins (1995) researched gender differences in college biology students at a state comprehensive university and found the overriding influence for males to succeed was the extent to which they perceive biology coursework to be both interesting and useful to them personally.

Virtually all of the female expectancy-value factors were significantly related to their choice of major and future coursework intentions. Support of the findings in Sullin's study is found in research by Rayle, Arredondo, and Kurpius (2005), which addressed predictor variables of educational self-efficacy of college women. In their study they found four variables that accounted for 24% of the variance in self-efficacy for all of the 876 female first-year college students. The four variables were personal valuing of education; self-esteem; academic stress; and family value of education. The authors found that the more the female students valued a higher education, the greater their self-esteem, the lower their academic stress, and the higher their educational self-efficacy. Using this literature as a basis, there does seem to exist relationships between gender, self-efficacy, outcome expectancy-value, and science achievement.

Race, Academic Self-efficacy and Outcome Expectancy

Since the 1960's social scientists have devoted much attention to the academic achievement of students of various races within the framework of higher education due to the transformation in the past four decades caused by economic, social, and demographic changes. With these sweeping changes came a challenge to institutions of higher education to recruit, prepare, and graduate students who were equipped to work in an increasingly diverse society. In order to meet this challenge effectively and appropriately, students from all segments of society were targeted. To achieve a diverse student body, higher education had to look beyond the traditional pool of applicants to recruit and enroll students from nontraditional educational and social backgrounds. The resulting emerging student population brought with it concerns for issues linked to graduation rates, fairness in student selection, campus climate, and composition of faculty and staff (Perna, 2000).

Academic services in colleges and universities were accountable for student retention of underrepresented populations. For example, Bonous-Hammarth (2000) studied the flow out of and into science, mathematics, and engineering majors among African American, American Indian, and Hispanic students. She found that these groups experienced greater attrition from these majors than did whites and Asian Americans.

In order to better predict student potential for success in post-secondary institutions, researchers devoted a great deal of time and effort to examining the relationships between student performance and academic and nonacademic variables (Bryson, Smith, & Vineyard, 2002). Most of the early research in ethnic differences in academic achievement was atheoretical, resulting in long listings of predictors of academic achievement difficult to combine into a coherent account (van Laar, 1997). Examples of some of those predictors were students' achievement prior to college, socioeconomic status, parental aspirations, place of residence, and the students' peer group. For example, Nettles (1988) found that African American students on average have parents with lower incomes, less prestigious jobs, fewer years of education, and are more often single parents than Caucasian students' parents. Thus there was a need to move beyond the descriptive level to a more in-depth analysis of the relationship among the variables related to college achievement.

According to Britner and Pajares (2001), research on self-efficacy in African Americans is scarce yet research has demonstrated that self-efficacy can differ by race/ethnicity and gender. Furthermore, most of the self-efficacy research has focused nearly exclusively on the academic areas of language arts and mathematics, and scant attention has been paid to the critical area of science (Britner & Pajares, 2001). These

authors suggested that the emphasis on language arts and mathematics achievement may be due to the priority placed on high levels of achievement in these two disciplines and to the more clear-cut criteria-based measurements available in mathematics. This was considered a serious omission in research by Britner and Pajares (2001) because science courses hold a prominent place in the academic curriculum.

Pajares and Kranzler (1995) used Bandura's (1986) theory that competence beliefs best predict achievement outcomes when beliefs assessed carefully correspond to the outcomes with which they are compared has been applied to explore mathematics self-efficacy in African Americans. They found that the mathematics self-efficacy of African Americans students was lower than that of their white peers. In addition Pajares and Johnson (1996) found that the writing self-efficacy of Hispanic high school students was lower than that of non-Hispanic, white students. Graham (1994) acknowledged that self-efficacy is an important component of academic motivation but noted that it has been too sparsely examined in studies of minority students. Dickerson, Neary, and Hyche-Johnson (2000) interviewed 11 Native American graduate students in a nursing program. These students noted that their academic challenges were due to the academic environment they perceived as rigid and judgmental. This pool of students who were enrolled in a nursing program in a research-intensive university felt isolated from both faculty members and fellow students. These Native American students believed their minority race with its different cultural values impeded their persistence in the educational program. In addition, Walker and Satterwhite's (2002) research is consistent with findings of previous studies that show African Americans perform academically below Caucasian students (Garibaldi, 1997; Mannan, Charleston, & Saghafi, 1986). Gloria and Hird (1999) suggested that the

relationship of ethnic identity and racial salience to academic efficacy issues is not well known; however, the role of anxiety in relation academics self-efficacy is well established by Bandura's (1997) theory of self-efficacy. Thus minorities' feelings of "differentness" or "alienation" have adverse behavioral consequences on estimates of self-efficacy and perceptions of control in achievement situations.

What does emerge as an unexplained concept is that in minorities, especially African Americans, self-efficacy remains strong in the face of lower academic achievement (Britner & Pajares, 2001). "Interestingly, Bandura (1986, 1997) has suggested that when social constraints and inadequate resources impede academic performance, self-efficacy may exceed actual performance not because students do not know what to do but because they are unable to do what they know (Britner & Pajares, 2001, p. 288). The research results of Britner and Pajares (2001) showed science self-efficacy predicted the science achievement of white students ($\beta = .714$) and African American students ($\beta = .527$). Further, for both white and African American students, science self-efficacy was again the only motivation variable to make a contribution to the prediction of science achievement. Similarly, Bryson, Smith, and Vineyard (2002) found that high school grade point average and self-efficacy both were positively correlated with first-year grade point average of African-American students. Yet there is research suggesting that educational self-efficacy, personal valuing of education, family valuing of education academic stress, and self-esteem are important for college women in general, and do not necessarily interact with race/ethnicity (Rayle et al., 2005). These results support the concept that self-efficacy beliefs are a critical component of academic

achievement and extend the strength of this contention to the academic area of most academic disciplines.

Parent's Education as a Predictor of Academic Achievement

It has been well documented that family plays a meaningful role in a child's academic performance and development (Cornell & Grossberg, 1987; Thompson, Alexander, & Entwisle, 1988; Tucker, Harris, Brady, & Herman, 1996). There are competing theories and predictions of the effects of family structure on academic achievement outcome. Two closely related family socioeconomic status variables have emerged as predictors of academic achievement and pursuit of education. Mothers' levels of education and family incomes influence adolescent educational outcome expectancy beliefs (Rhea & Otto, 2001). Wilson and Wilson (1992) found that parents' levels of education are related to adolescents' educational aspirations. Past family studies often focus on the mother's education when assessing influence on children's educational aspirations and attainments due to the old tradition of mothers as the primary agents of socialization for their children (Stevenson & Baker, 1987). Others have found mothers' levels of education compared to fathers' is a stronger influence on children's educational abilities (Melby & Conger, 1996; Mercy & Steelman, 1982; Smith, 1991). Similarly Otto (2002) provided evidence that adolescents continue to look most to their mothers for career advice. Although parent's education was hypothesized to be a strong predictor of adolescent academic performance, Nuijens et al. (2000) and her colleagues found this variable did not emerge as significant.

Although the link between family and academic performance has been well established for school-age children and teenagers, the literature on college students is

limited (Walker & Satterwhite, 2002). Contrary to the literature on a mother's influence a report by Maryland's Higher Education Commission (1997) identified the father's educational level was recognized as one of the two best predictors of grade point average of college students, the other being gender. More recently, Eccles, Vida, and Barber's (2004) research on family factors prediction of college attendance showed mother's educational level was significant in determining subsequent college enrollment of children. Recent research has focused on identifying how various parent influences are related to their children's academic achievement and not specifically on university level of achievement (Bleeker & Jacobs, 2004).

Literature on parental expectations and academic performance is more abundant than the relationships of parent's educational level and their students' academic performance. Examination of the literature on expectations reflects that findings often highlight differences by race and reinforce the need to investigate the variable parents' expectations across racial groups. For example, Thompson et al. (1988) suggested that Caucasian parents' grade expectations were related to students' actual grade achievement, while African American parents' expectations were unrealistically high and unrelated to actual grades. Similarly, Tucker et al. (1996) found that African American parents do not have unrealistic expectations for their children. Furthermore, they suggested that the expectations of African American mothers and fathers significantly impacted grades due to their own level of education. Some researchers acknowledge that family status variables such as parental education are less predictive of academic performance for African American students than peer and neighborhood variables (Dornbusch, Ritter & Steinberg, 1991; Gonzales, Cauce, Frieman, & Mason, 1996).

In an examination of predictor variables for females taking high school calculus, findings supported that the mother's educational level not only influence but also predict future academic choices of young women (Reynolds & Conaway, 2003). Educational attainment of the mother and not the father was found to be significant when all predictive variables were investigated. Hossler, Bean, and associates (1990) identified a number of variables that affect student retention. They are high class rank in high school; college preparatory courses; realistic goals; well educated parents; strong financial support; and success in high school. Rayle et al. (2005) results were even more specific for they found that educational self-efficacy was correlated both with mother's education (r = .14, p = .001) and father's education (r = .18, p = .001).

In an effort to address concerns for national educational achievement of American's children, the National Assessment of Educational Progress (Campbell, Hombo, & Mazzeo, 1999) embarked on a project to examine national trends in reading, mathematics, and science achievement. Three decades of student performance were quantified in each of the three academic disciplines. Among the findings was an examination of trends in scores by parental education level. In each subject area and age group, students who reported higher parental education levels tended to have higher average scores (Campbell, Hombo, & Mazzeo, 1999).

Undergraduate, Science, and College Grade Point Average

Academic achievement is influenced by a multitude of factors. Attitude, for example, leads to achievement (Schibeci & Riley, 1986) as well as aptitude is needed for successful performance (Schunk, 1991). According to Bandura (1997), academic performance is a result of intellectual capability and motivation as well. Numerous

investigators examined the influence of undergraduate grade point average (GPA) on academic success and found between the two variables evidence of significant positive correlation (Chavous, 2000; Sternberg, 2005, Thomas & Stanley, 1969).

Two studies conducted during the 1960's were early evidence of the importance of high school grades as predictors of academic success. Irvine (1966), after a five-year study of University of Georgia students, noted that high school grade point average was the best single predictor of persistence. Ivey (1966) indicated that high school rank was the most effective predictor of success in college.

Although there has been considerable variability among studies with regard to the predictive value of variables that relate to college success, there is enough consistency to warrant that high school scholarship has been found to be the best *single* predictor of college success (Thomas & Stanley, 1969). McCleary, Aasen, and Slotnick (1999) found that the predictor variables most strongly associated with passing physiology were pre-physiology, GPA, and the number of college science courses taken before enrollment in physiology, demonstrating that past academic performance predicts future academic performance. Some have found women to be more predictable academically than men (Thomas & Stanley, 1969) while others reported more explained variance in men. For example, Spady (1971) found that 14.77% of the explained variance in grade performance in college could be attributed to academic potential for men and 13.06% for women.

Using these general findings as building blocks, it is important to note some specific findings for consideration. Chaney and Farris (1991) found that students who had above the mean high school grade point averages graduated at a much higher rate than students who had high school grade point averages below the mean. Myers and Pyles

(1992) found that high school grade point average was a good predictor for both white and African-American college freshman. But Strange (2000) found grade point average to be only one measure of student success across ethnic groups. Similarly, Levin and Wyckoff (1990) reported that although high school grade point average as a variable used to predict success is not constant over time, it is an important predictor during engineering student's first two years.

Review of All Related Literature Summary

This review of literature defines the totality of the independence of the constructs self-efficacy and outcome expectancy. Self-efficacy is one's personal confidence in the ability to succeed at a given task, where as, outcome expectancy theory represents the assignment of a probability of an outcome occurring due to a specific behavior. Outcome expectancy is an interaction of (a) an individual's expectations of obtaining a particular outcome as a function of performing behavior, and (b) the extent to which the individual assigns value to the possible outcome of the behavior.

Research studies have shown both self-efficacy and outcome expectancy affect academic achievement. Discipline-specific courses such as math, writing, physics, and chemistry all have been examined for related effects of self-efficacy or outcome expectancy. Few studies addressed the issue of self-efficacy and outcome expectancy as predictors of science success, and none were dedicated to the subject of human anatomy. A direct correlation between self-efficacy and outcome expectancy and grades in anatomy may exist, and it is possible they may emerge as predictors of final grades but this has not yet been investigated.

Additionally a multitude of research has focused on the academic achievement predictive variables gender; race; parents' levels of education; and high school grade point average. There was a scant amount of literature that specified these variables and the discipline of human anatomy.

This study aims for a better understanding of the relationships, if any, of outcome expectancy theory within self-efficacy theory as they relate to final grades in human anatomy.

CHAPTER 3

METHODOLOGY

Purpose of Study

The purpose of this study is to determine the influence of selected demographic and psychological characteristics on the academic achievement of students enrolled in an undergraduate human anatomy course at a research-extensive university in the Southern region of the United States.

Dependent Variable

The dependent variable in this study is academic achievement of students enrolled in a human anatomy course (as measured by the final grade received in the human anatomy course) at a research-extensive university in the Southern region of the United States.

Specific Objectives

The following specific objectives were formulated to guide this research:

1. To describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States on the following demographic and academic characteristics:

    (a) Gender;

    (b) University Classification;

    (c) Race;

    (d) Father's Level of Education;

    (e) Mother's Level of Education;

(f) High School Science Grade Point Average;

(g) High School Grade Point Average;

(h) College Grade Point Average.

2. To describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States on the following selected psychological characteristics:

(a) Self-Efficacy;

(b) Outcome Expectancy as measured by:

1. Likelihood of meeting learning outcomes

2. Value placed on learning outcomes.

3. To determine if a relationship exists between self-efficacy and outcome expectancy among students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States.

4. To determine if a relationship exists between the following specific psychological characteristics and academic achievement (as measured by final grade received in a human anatomy course) in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Self-Efficacy and Final Grades;

(b) Outcome Expectancy and Final Grades as measured by:

1. Likelihood of meeting learning outcomes

2. Value placed on learning outcomes.

5. To determine if a relationship exists between the following selected demographic characteristics and academic achievement of students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Gender;

(b) University Classification;

(c) Race;

(d) Father's Level of Education;

(e) Mother's Level of Education;

(f) High School Science Grade Point Average;

(g) High School Grade Point Average;

(h) College Grade Point Average.

6. To determine if a model exists that significantly increases the researcher's ability to accurately explain the variance in academic achievement (as measured by final grade received in a human anatomy course) from the following psychological and demographic characteristics of students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Self-Efficacy;

(b) Outcome Expectancy as measured by:

1. Likelihood of meeting learning objectives

2. Value placed on learning outcomes;

(c) Gender;

(d) University Classification;

(e) Race;

(f) Father's Level of Education;

(g) Mother's Level of Education;

(h) High School Science Grade Point Average;

(i) High School Grade Point Average;

(j) College Grade Point Average.

Population and Sample

The target population for this study is defined as students enrolled in an undergraduate human anatomy course at research-extensive universities in the United States. For the purposes of this study, an undergraduate human anatomy course is defined as a course in which the curriculum is lecture-based and comprehensive of all the major systems of the body (Louisiana State University Course Catalog, 2006). The accessible population for this study is defined as undergraduate students enrolled in a semester-long human anatomy course at a research-extensive university in the Southern region of the United States during the fall 2005 and spring 2006 semesters. The sample included all students in the accessible population who agreed to participate when requested to do so. All students enrolled in human anatomy during the fall 2005 and spring 2006 semesters were given the opportunity to participate in this study. Those choosing to participate were given extra credit for completing surveys that would yield demographic information and levels of self-efficacy and outcome expectancy in human anatomy. Participating students gave permission for their final grades to be used in the study. Those choosing not to participate in this study were given alternative ways in

which to receive the same amount of extra credit; therefore all students were given equal access to extra credit in the human anatomy class. Collected data from students remained anonymous, and final grades were only accessible to the professor of record and the researcher. Of the 535 students enrolled in human anatomy in fall 2005 and spring, 2006 450 (84.1%) students chose to participate in this study.

Instrumentation

Three instruments were used to collect data on specific demographic and academic psychological variables related to the objectives of this study. The specific variables measured were selected after an extensive review of related literature on demographics, academic self-efficacy, and academic outcome expectancy.

Demographic Instrument

Demographic variables recorded included:

1. Gender – as reported by the students as female or male;
2. University Classification – as indicated by the students from the following: Freshman, Sophomore, Junior, Senior;
3. Race – as indicated by the students from the following: Anglo-American, African-American, Hispanic-American, Asian-American, and others who were asked to specify their race;
4. Father's highest level of education as indicated by the students from the following: None, 1-4 years, 5-8 years, 9-12 but didn't graduate, High School Diploma, Some Years of College, College Diploma, Some Graduate School, Graduate or Professional Degree;

5. Mother's highest level of education as indicated by the students from the following: None, 1-4 years, 5-8 years, 9-12 but didn't graduate, High School Diploma, Some Years of College, College Diploma, Some Graduate School, Graduate or Professional Degree;
6. High School Science Grade Point Average as reported by the students from the following: (on a four-point scale) 2.0 – 2.5, 2.51 – 3.0, 3.1 – 3.5, 3.51 – 4.0;
7. High School Grade Point Average as reported by the students from the following: (on a four-point scale) 2.0 – 2.5, 2.51 – 3.0, 3.1 – 3.5, 3.51 – 4.0;
8. College Grade Point Average as reported by the students from the following: (on a four-point scale) 2.0 – 2.5, 2.51 – 3.0, 3.1 – 3.5, 3.51 – 4.0.

Self-Efficacy Instrument

There was only one instrument found that fit the scope of evaluating self-efficacy in students enrolled in human anatomy. An all-purpose measure of self-efficacy is too broad and is not a good method for determining self-efficacy in a specific discipline (Witt-Rose, 2003). Self-efficacy is domain-specific so more accurate results are obtained when an instrument specific to the discipline is administered (Bandura, 1997). Self-efficacy can be measured by asking subjects to report how confident they are about performing and succeeding in a particular situation (Pajares, 1996). Although task-specific judgments of self-efficacy are preferred, in educational research grades and achievement tests results do not correspond well with such specific measurements (Witt-Rose, 2003). To compensate, researchers utilize word items to reflect the course rather than address specific course objectives, which subsequently results in a broader determination of self-efficacy (Pajares, 1996). Although too broad a measurement of self-efficacy can nullify its effect, Pajares

(1996) stated that research findings support general measurement of self-efficacy as a good predictor of grades, choice of academic major, and intent to enroll in a particular course. Considering this literature, the instrument used for this study was the Level of Confidence in Anatomy and Physiology I (Witt-Rose, 2003), which was constructed to be domain specific. The instrument was a self-report confidential survey that measured student self-efficacy. The responses for this instrument are 15 self-efficacy items on a five-point Likert-type scale. *(1 = strongly disagree to 5 = strongly agree).* Statements were phrased both positively and negatively to increase reliability and reduce response patterns.

Outcome Expectancy/Value Instrument

No existing instrument was found to specifically measure learning outcomes in anatomy; therefore, an instrument was constructed by the researcher. The instrument consists of two, nine-item sections measuring the likelihood that students will achieve certain learning outcomes and the value the students place on the same nine items. The Outcome Expectancy instrument was modeled after an Outcome Expectancy instrument developed by Williams et al. (2005). These authors incorporated perceived likelihood items and subjective values placed on these same items. Content validity for the Outcome Expectancy instrument in this study was established through critique of the instrument by a panel of experts consisting of faculty who teach university-level undergraduate human anatomy courses. Based on their feedback, it was determined the instrument had adequate content validity for this study and no changes were made in the instrument.

Additionally, this instrument was piloted prior to implementation in a university classroom with a similar population of undergraduate students enrolled in a semester-long

human anatomy course at a research-extensive university. After administering Cronbach's alpha, it was determined the instrument had sufficient reliability.

Academic achievement for the purpose of this study is defined by students' final grades in human anatomy assigned at the end of the semester. Final grades will be calculated and distributed on a scale of 90-100 = A; 80-89 = B; 70-79 = C; 60-69 =D; and below 60 earned an F grade. Scores on all five semester exams were used to calculate the final grade with numerical value placed on each individual exam.

Data Collection

Data on the specific demographic and academic variables related to this study were collected from the accessible population of students enrolled in a human anatomy course at a research-extensive university in the Southern region of the United States. The accessible population consisted of students enrolled in a human anatomy course at a Research I University in the Southeast. All subjects were volunteers of the study, and all rules of the Institutional Review Board were followed. There were 450 (84.1%) students taking part in the study, which was held in the fall semester 2005 and spring semester 2006.

Approval for implementation for the study was obtained from the Louisiana State University Institutional Review Board for Human Subject Protection prior to the initial study. The approval for the study was granted August 16, 2005, and given IRB # 3077.

Human Anatomy is a preparatory course in which students intensively study the structure of the human body's systems. The course is typically taken by students fulfilling a curriculum requirement and/or students preparing to enter the allied health profession. Subjects were approached prior to the first lecture in an undergraduate human anatomy

course. Students were apprised of the purpose of the study and told their participation was not mandatory nor would their participation or lack of participation affect their final grade. Further, students were informed that all information would be kept confidential. Following instructions, students were given a consent form (Appendix A) and three surveys which included: demographic survey (Appendix B); Level of Confidence in Human Anatomy Scale (Appendix C); and Outcome Expectancy Scale (Appendix D). Subjects remained in the lecture hall while completing the survey. Upon completion of the survey, students returned questionnaires and consent forms and remained in the lecture hall for the ensuing first lecture of the semester.

Final assigned grades were retrieved from the professor of record for each of the two semesters, fall 2005 and spring 2006. Final grades were based on a compilation of all test grades received in class by the participating students and the average of the five exams resulted in the final grade the student received in human anatomy.

Specific demographic and academic variables were selected according to the research questions presented in this study.

Data Analysis

Data collected in this study was analyzed using the following descriptive statistical techniques for each respective study objective.

Objective 1

To describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States on the following demographic and academic characteristics:

(a) Gender;

(b) University Classification;

(c) Race;

(d) Father's Level of Education;

(e) Mother's Level of Education;

(f) High School Science Grade Point Average;

(g) High School Grade Point Average;

(h) College Grade Point Average.

This objective is descriptive and will be analyzed using descriptive statistics. Frequencies and percentages will be used for variables that are measured on a categorical scale (nominal or ordinal). These specific variables are:

(a) Gender;

(b) University Classification;

(c) Race;

(d) Father's Level of Education;

(e) Mother's Level of Education

(f) High School Science Grade Point Average;

(g) High School Grade Point Average;

(h) College Grade Point Average.

Objective 2

To describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States on the following selected psychological characteristics:

(a) Self-Efficacy

(b) Outcome Expectancy as measured by:

1. Likelihood of obtaining learning outcomes;
2. Value placed on learning outcomes.

Means and standard deviations will be used for these variables which are measured on an interval scale.

Objective 3

To determine if a relationship exists between self-efficacy and outcome expectancy among students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States. This objective is correlational in nature and data will be analyzed using a Pearson's Product Moment Correlation Coefficient. This statistical technique is appropriate because both of the variables being correlated are at an interval level.

Objective 4

To determine if a relationship exists between the following specific psychological characteristics and final grades obtained by students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Self-efficacy and Final Grades;

(b) Final Grades and Outcome Expectancy as measured by:

1. Likelihood of meeting learning outcomes;
2. Value placed on learning outcomes.

This objective is correlational in nature and data will be analyzed using Pearson's Product Moment Correlation Coefficient. This statistical technique is appropriate because of both

relationships being measured use interval data. Pearson's Product Moment Correlation is the most commonly used statistical technique in the behavioral sciences and measures the strength and direction of the relationship between two variables (Hinkle et al., 2002).

Objective 5

To determine if a relationship exists between the following selected demographic characteristics of students and final grades in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Gender;

(b) University Classification;

(c) Race;

(d) Father's Level of Education;

(e) Mother's Level of Education;

(f) High School Science Grade Point Average;

(g) High School Grade Point Average;

(h) College Grade Point Average.

To maximize interpretability, comparative measures will be used for those variables that are nominal in nature. This objective is correlational in nature, and these bivariate relationships will be analyzed using the following statistical techniques:

(a) Gender – Independent t Test;

The independent t-test compares the means of two independent levels of a given variable in order to determine if the calculated mean differences exhibit statistical significance.

(b) Race – One-Way Analysis of Variance

Prior to employing the ANOVA, an analysis and calculation of Levine's Test of Homogeneity of Variance will be calculated to determine if group variances are equal. When .05 is established as the level of significance, homogeneity of variances is present if the significance of the Levine's statistic is greater than .05, thus resulting in a failure to reject the null hypothesis of equal variances.

The following variables that are ordinal in nature will be analyzed using a Kendall's Tau statistical technique. Kendall's Tau (1947) statistical technique is useful as a robust or resistant measure of association (Cliff & Charlin, 1991). It is robust to the nature of the distributions being dealt with and the relative insensitivity to extreme values. Kendall's Tau quantifies the concordance between ordinal data as two variables and there are relatively large numbers of tied ranks among the data.

(c) University Classification;

(d) Father's Level of Education;

(e) Mother's Level of Education;

(f) High School Science Grade Point Average;

(g) High School Grade Point Average;

(h) College Grade Point Average.

Objective 6

To determine if a model exists that significantly increased the researcher's ability to accurately explain the variance in final grades received from the following psychological and demographic characteristics of students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 at a research-extensive university in the Southern region of the United States:

(a) Self-Efficacy;

(b) Outcome Expectancy as measured by:

1. Likelihood of meeting learning outcomes;
2. Value placed on learning outcomes;

(c) Gender;

(d) University Classification;

(e) Race;

(f) Father's Level of Education;

(g) Mother's Level of Education;

(h) High School Science Grade Point Average;

(i) High School Grade Point Average;

(j) College Grade Point Average.

To accomplish this objective a Multiple Regression Analyses statistical technique will be used to analyze the data. Based on the literature, the independent variable will be entered into the analysis in the following order:

(1) Self-Efficacy.

To determine if there is additional explanatory power, a step-wise regression technique will be used on the following variables:

(1) Outcome Expectancy;

(2) Gender;

(3) University Classification;

(4) Race;

(5) Father's Level of Education;

(6) Mother's Level of Education;

(7) High School Science Grade Point Average;

(8) High School Grade Point Average;

(9) College Grade Point Average

CHAPTER 4

RESULTS

The primary purpose of this study was to determine the influence of selected demographic and psychological characteristics on the academic achievement of students enrolled in an undergraduate human anatomy course at a research-extensive university in the Southern region of the United States. The dependent variable in this study is academic achievement and was defined as the final numerical grade received in the human anatomy course.

The findings of this study are presented in the following sections organized by objective.

Objective One Results

The first objective of this study was to describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States on the following demographic and academic characteristics:

(a) Gender;

(b) University Classification;

(c) Race;

(d) Father's Level of Education;

(e) Mother's Level of Education;

(f) High School Science Grade Point Average;

(g) High School Grade Point Average;

(h) College Grade Point Average;

(i) Academic Achievement as Measured by Final Grade

There were 449 students in the sample and they are described on each variable as follows:

Gender

The first variable on which the students were described was gender. Of the 445 students who reported their gender, 269 (60.4%) identified themselves as female and 176 students (39.6%) identified themselves as male. Four students chose not to identify their gender.

Classification

Another variable on which the students were described was their classification in college. Of the 449 students, 434 reported their student classification. The remaining 15 students chose not to identify their classification (See Table 1). Of the 434 students who

TABLE 1

Classification Reported by Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Classification	Frequency	Percent
Senior	98	22.6
Junior	174	40.1
Sophomore	149	34.3
Freshman	13	3.0
Total	434[a]	100.0

[a] 15 of the study participants chose not to respond to this item.

reported their classification, the largest group was Junior (n = 174, 40.1%). Sophomore was the classification identified by the second largest group of students (n = 149, 34.3%).

Race

Subjects were asked to identify their race as either Anglo-American, African – American, Hispanic-American, Asian-American, or specify their race in an area designated as Other. The largest group of subjects identified themselves as Anglo-American (n = 347, 79.1%), with the second largest group identified as African-American (n = 43, 9.8%) (See Table 2).

TABLE 2

Race Reported by Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Race	Frequency	Percent
Anglo-American	347	79.1
African American	43	9.8
Other[a]	19	4.3
Asian American	18	4.1
Hispanic American	12	2.7
Total	439[b]	100.0

[a] The 19 study participants who indicated an "Other" race did not specify the race
[b] Ten of the study participants chose not to respond to this item.

Highest Grade or Year in School Fathers Had Completed

Students were asked to describe their father's highest grade or year in school completed. The largest group of students (n = 143, 32.1%) reported their father had completed a "College Diploma" and the second largest group of students (n = 94, 21.1%) indicated that their father had completed a "high school diploma." The third largest group

(n = 90, 20.2%) were students who reported that their fathers that had completed "Some Years of College," followed closely by students (n = 89, 20.0%) who reported that their father had a "Graduate or Professional Degree." The results of highest level of education completed by fathers of the study participants are presented in Table 3.

TABLE 3

Highest Grade or Year in School Completed by Fathers Reported by Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Level of Education	Frequency	Percent
Graduate/Professional	89	20.0
Some Graduate School	8	1.9
College Diploma	143	32.1
Some Years of College	90	20.2
High School Diploma	94	21.1
9 thru 12 but did not graduate	16	3.6
5 thru 8	5	1.1
1 thru 4	0	0
None	0	0
Total	445[a]	100.0

[a] Four of the study participants chose not to respond to this item.

Highest Grade or Year in School Mothers Had Completed

Participants were also asked to indicate demographic information about their mother's education just as they had done with father's level of education. Reported mother's level of education was very similar to that reported for father's level with the highest number of mothers (n = 141, 31.5%) having completed a "College Diploma." However, the next most frequently reported level of education completed by mothers was "Graduate/Professional" (n = 95, 21.3%) (See Table 4).

TABLE 4

Highest Grade or Year in School Completed by Mothers Reported by Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Level of Education	Frequency	Percent
Graduate/Professional	95	21.3
Some Grad School	18	4.0
College Diploma	141	31.5
Some College	88	19.7
High School Diploma	91	20.4
9 thru 12 but did not graduate	10	2.2
5 thru 8	1	.2
1 thru 4	3	.7
None	0	0
Total	449	100.0

Having received a high school diploma was the third most frequently reported category (n = 91, 20.4%) of level of education completed by mothers of the study subjects.

High School Grade Point Average

Another characteristic on which study participants were asked to provide demographic information was high school grade point average (GPA). Students were asked to check the most appropriate category from the following options: "2.0 to 2.5," "2.51 to 3.0," "3.1 to 3.5," and "3.51 to 4.0." The GPA category that was reported by the largest number of study participants was "3.51 to 4.0" with 298 students (66.7%) indicating this option. Additionally, 121 respondents (27.1%) indicated that their high school GPA was in the "3.1 to 3.5" category (see Table 5). Two of the study participants did not report information regarding their high school GPA.

TABLE 5

High School Grade Point Average Reported by Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

High School GPA	Frequency	Percent
3.51 to 4.0	298	66.7
3.1 to 3.5	121	27.1
2.51 to 3.0	25	5.5
2.0 to 2.5	3	.7
Total	447[a]	100.0

[a] Two of the study participants chose not to respond to this item.

College Grade Point Average

College grade point average was another demographic characteristic students were asked to report. As with high school grade point average, students were asked to check the most appropriate category from the following options: "2.0 to 2.5," "2.51 to 3.0," "3.1 to 3.5," and "3.51 to 4.0." The largest number of study participants (159, 35.9%) checked the category "3.1 to 3.5." Furthermore, 131 (29.6%) indicated that their college GPA was in the "3.51 to 4.0" category (See Table 6).

TABLE 6

College Grade Point Average Reported by Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

College GPA	Frequency	Percent
3.51 to 4.0	131	29.6
3.1 to 3.5	159	35.9
2.51 to 3.0	125	28.2
2.0 to 2.50	28	6.3
Total	443[a]	100.0

[a] Six of the study participants chose not to respond to this item.

High School Science Grade Point Average

Another demographic variable which participants were asked to report was their high school science graduate point average. As with the other two variables, high school and college GPA, students were asked to check the most appropriate category from the following options: "2.0 to 2.5," "2.51 to 3.0," "3.1 to 3.5," and "3.51 to 4.0." With 239

students (54.0%) checking the category "3.51 to 4.0," this accounted for the majority of the participants. Additionally, 144 (32.5%) reported that their high school science GPA was in the "3.1 to 3.5" category (see Table 7).

TABLE 7

High School Science Grade Point Averages Reported by Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

High School Science GPA	Frequency	Percent
3.51 to 4.0	239	54.0
3.1 to 3.5	144	32.5
2.51 to 3.0	55	12.4
2.0 to 2.5	5	1.1
Total	443[a]	100.0

[a] Six of the study participants chose not to respond to this item.

Academic Achievement as Measured by Final Grade

Final assigned grades were retrieved from the professor of record for each of the two semesters, fall 2005 and spring 2006. Final grades were based on a compilation of all test grades received in class by the participating students and the average of the five exams resulted in the final grade the student received in human anatomy. Final grades ranged from 41.25 to 99.38 (M = 80.79, SD = 9.45). For the purposes of this study, a grade of A = 90.0% – 100%, B = 80.0% – 89.9%, C = 70.0% - 79.9%, D = 60.0% - 69.9%, and F = < 60%. (See Table 8) Of the 345 students who completed the course, the highest number of students (n = 130, 37.7.7%) made a grade of B. Those students who made an F in the course accounted for only five students (1.5%).

TABLE 8
Final Grades Achieved by Students Enrolled in a Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States.

Final Grade	Frequency	Percent
A	69	20.0
B	128	37.1
C	101	29.3
D	39	11.3
F	8	2.3
Total	345[a]	100.0

[a] 104 students did not receive a final grade
[b] $M = 80.70$, $SD = 9.45$

Objective Two Results

The second objective of this study was to describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States on the following selected psychological characteristics:

(a) Self-Efficacy and;

(b) Outcome Expectancy as measured by:

1. Likelihood of meeting learning outcomes

2. Value placed on learning outcomes.

To accomplish the first part of this objective, participants were asked to rate their level of confidence on 15 items pertaining to self-efficacy. Responses were reported on the following five-point Likert-type scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

To aid in the interpretation of these responses, the researcher established a scale of interpretation as follows: 1.0 – 1.50 = strongly disagree, 1.51 – 2.50 = disagree, 2.51 – 3.49 = neutral, 3.50 - 4.49 = agree and 4.50 - 5.0 = strongly agree. The Cronbach's alpha measure of internal consistency was used as a reliability estimate of the scale and was determined to be α = .89, which according to Hair, Black, Babin, Anderson, and Tatham (2006) is acceptable (.70 or higher).

Of the 15 items on the scale, the item with which respondents had the highest level of agreement was "I believe that if I exert enough effort, I will be successful in anatomy (M = 4.63, SD = 0.61). This item was classified using the researcher's established interpretive scale in the "Strongly Agree" category. The item "I think I will receive a C or better in anatomy" received the second highest mean rating (M = 4.56, SD =0 .61). This item was also classified in the "Strongly Agree" interpretive category. The item that received the lowest mean rating was "I don't think I will get a good grade in anatomy" (M = 1.57, SD = 0.81). According to the researcher's interpretive scale this item was classified in the "Disagree" category. Overall, 2 of the 15 items were classified in the "Strongly Agree" category, 8 were classified in the "Agree" category, 2 items were in the "Neutral" category, and 3 were in the "Disagree" category. See Table 9 for a presentation of the means, standard deviations, and response classification of each item.

TABLE 9

Self-Efficacy of Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Item	*N*	*M*[a]	*SD*	Classification[b]
I believe that if I exert enough effort, I will be successful in anatomy.	449	4.63	0.61	Strongly Agree
I think I will receive a C or better in anatomy.	449	4.56	0.62	Strongly Agree

(Table cont)

I am confident I have the ability to learn the material taught in anatomy…	440	4.47	0.63	Agree
I am confident I can do well in anatomy.	449	4.36	0.68	Agree
I am confident I can understand the topics taught in anatomy.	449	4.29	0.69	Agree
I am confident that I could explain something learned in this class to another person	449	4.16	0.73	Agree
I am confident I can do well on the lecture exams in anatomy.	449	4.08	0.72	Agree
I am confident I can do well in the lab work for anatomy.	449	3.99	0.76	Agree
I think I will do as well or better than other students in anatomy.	449	3.98	0.86	Agree
I am confident I can do well in classroom discussion.	449	3.77	0.86	Agree
Compared with other students in this class, I think I have good study skills.	449	3.47	0.92	Neutral
I feel like I don't know a lot about anatomy compared to other students in this class.	449	2.65	0.99	Neutral
Compared with other students in this class, I don't feel like I'm a good student.	449	1.90	0.88	Disagree
I don't think I will be successful in anatomy.	449	1.64	0.87	Disagree
I don't think I will get a good grade in anatomy.	449	1.57	0.81	Disagree

[a] Response scale: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree.
[b] Interpretive scale: 1.50 or less = strongly disagree, 1.51 - 2.50 = disagree, 2.51 -3.49 = neutral, 3.50 - 4.49 = agree, 4.50 - 5.0 = strongly agree.

To further summarize the information regarding self-efficacy of students enrolled in human anatomy, the researcher used factor analysis to determine if primary underlying constructs could be identified in the scale. The factor analysis conducted was exploratory and used the principal components extraction procedure with varimax rotation.

Prior to conducting the planned factor analysis, the researcher examined the cases-to-variable ratio (29.1:1), which exceeded the cases-to-variable ratio recommended (minimally 5:1) by Hair et al. (2006). A review of the anti-image correlation matrix revealed measures of sampling adequacy all above the 0.5 threshold. Furthermore, a Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was conducted and revealed a KMO value of 0.913. KMO values above 0.5 determine sampling to be adequate (University of Newcastle Upon Tyne, 2006). Additionally, a Bartlett's Test of Sphericity was performed to test the hypothesis that the variables in the population correlation matrix are uncorrelated. The strength of the relationships between variables were found to be strong and acceptable for factor analysis based on the results of this test ($X^2_{105,\, n = 449} = 2850.79$, $p < .001$) (University of Newcastle Upon Tyne, 2006).

After determining that the data was adequate for completing an exploratory factor analysis, the next step in conducting the test was to determine the number of factors to be extracted from the scale. The researcher used a combination of the latent root criterion and the scree test criterion to make this decision. When the scree test was examined, the number of factors was judged to be one or two. Subsequently, the researcher examined the loadings for the one and two factor models for the self-efficacy scale, and both were found to be statistically acceptable. The one factor solution was selected by the researcher since this model was determined to be conceptually most interpretable.

The factor identified in the scale was labeled by the researcher as Self-Efficacy and it included all items. A total of 15 items with loadings ranging from a high of .82 to a low of .47 explained 42.9% of the overall variance in the scale. The results of the factor analysis including the factor, the percentage of variance explained, and factor loading for each of the items are presented in Table 10.

TABLE 10

Factor Analysis of Level of Confidence in Anatomy Scale among Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Factor: Self-Efficacy (42.9% of variance explained)	**Factor Loading**
I am confident I can do well in anatomy.	.82
I am confident I have the ability to learn the material taught in anatomy	.81
I am confident I can do well on the lecture exams in anatomy.	.79
I think I will do as well or better than other students in anatomy.	.77
I am confident that I could explain something learned in this class to another person.	.68
I think I will receive a C or better in anatomy	.66
I am confident I can understand the topics taught in anatomy.	.65
I don't think I will be successful in anatomy (Recoded).	.64
I am confident I can do well in the lab work for anatomy.	.62

(Table cont)

I believe that if I exert enough effort, I will be successful in anatomy.	.59
I don't think I will get a good grade in anatomy (Recoded).	.58
I am confident I can do well in classroom discussions.	.54
I feel like I don't know a lot about anatomy compared to other students in this class (Recoded).	.50
Compared with other students in this class, I think I have good study skills.	.49
Compared with other students in this class, I don't feel like I'm a good student (Recoded).	.47

Examination of the items in the scale designed to measure self-efficacy revealed that four statements were worded such that a response of "Strongly Disagree" indicated a higher level of perceived level of self-efficacy. These items included, "I don't think I will be successful in anatomy"; "I feel like I don't know a lot about anatomy compared to other students in this class"; "Compared with other students in this class, I don't feel like I'm a good student"; and "I don't think I will get a good grade in anatomy." Since the original response values assigned to all the items in the scale except these four items were such that a higher value was indicative of a higher perceived level of self-efficacy, and one of the researcher's planned analyses was to compute a self-efficacy score, the coding of these four items was reversed so that for all items, higher numerical values were indicative of higher perceived self-efficacy. Therefore, for these four items a value of "5" was assigned for a response of "Strongly disagree," a value of "4" was assigned for a response of "Disagree," a value of "3" was assigned for a response of "Neutral," a value

of "2" was assigned for a responses of "Agree," and a value of "1" was assigned for a response of "Strongly agree." The researcher was then able to compute an overall self-efficacy score with higher values consistently, indicating higher levels of self-efficacy. After recoding these four items, the overall self-efficacy scores ranged from a minimum of 2.13 to a maximum of 5.00 ($M = 4.13$, $SD = .49$).

To accomplish the second part of this objective, participants were asked to rate their expectancy of learning outcomes in human anatomy. The instrument used to collect this data included two dimensions of outcome expectancy, Likelihood and Value. The instrument consisted of two, nine-item sections measuring the likelihood that students will achieve certain learning outcomes and the value the students place on the same nine items. Responses for Likelihood were reported on a 10-point anchored scale with 0 = "Not at all likely" to accomplish the learning objective and 9 = "Completely likely" that the objective would be accomplished. Similarly, responses for the Value portion of the instrument were on a ten-point scale with 0 = "Not at all valuable" and 9 = "Extremely valuable."

Likelihood

Students were asked to rate the likelihood they would achieve nine learning outcomes in human anatomy while enrolled in the class. The nine-item learning instrument was designed to measure students' perceived likelihood of successfully completing each item.

To aid in the interpretation of the responses, the researcher established a scale of interpretation as follows: 0 – .99 = Not at all likely; 1.00 – 2.40 = Slightly Likely; 2.41 – 3.80 = Somewhat Likely; 3.81 – 5.20 = Moderately Likely; 5.21 – 6.60 = Substantially Likely; 6.61 – 8.00 = Highly Likely; and 8.01 – 9.0 Completely Likely.

Cronbach's alpha measure of internal consistency as a reliability estimate of the Likelihood scale was determined to be α = .94. According to Hair, Babin, Anderson, and Tatham (2006) this reliability score is acceptable (.70 or higher).

The highest mean rating of the nine items measuring the students' likelihood of meeting the learning outcomes was the item "I will understand the 'big picture' of how the anatomic structures work together" (*M* = 8.21, *SD* = 1.39) which based on the researcher's established interpretive scale was described as "Completely Likely." The item "I will be able to identify expertly specific structures on diagrams and models" had the lowest mean of the nine items (*M* = 7.50, *SD* = 8.00). According to the researcher's interpretative scale this item was considered "Highly Likely" to be accomplished. Overall, two of the items in the scale were classified as "Completely Likely" and seven items received ratings which were classified in the "Highly Likely" range. Descriptive information for all of the items in the likelihood scale is presented in Table 11.

TABLE 11.

Likelihood of Students Achieving Learning Outcomes Responses by Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Item	*N*	*M*	*SD*	*Classification*[a]
I will understand the "big picture' of how the anatomic structures work together.	447	8.21	1.39	Completely Likely
I will learn the anatomical structures and concepts that will help me to succeed in my college program.	447	8.15	1.30	Completely Likely
I will understand and be able to apply the clinical relevance of anatomic structures.	447	7.89	1.47	Highly Likely

(Table cont)

I will acquire a thorough knowledge of the structural organization of the human body and become proficient in describing the functional aspects of gross anatomy.	447	7.78	1.41	Highly Likely
I will understand the structural relationship between individual parts that form an integrated whole.	447	7.74	1.38	Highly Likely
I will be able to analyze body systems and organs in terms of the details of their structure.	447	7.68	1.46	Highly Likely
I will understand selected clinical disorders that arise from abnormalities in structures.	447	7.62	1.53	Highly Likely
I will become fluent in the terminology and vocabulary of gross anatomy.	447	7.52	1.64	Highly Likely
I will be able to identify expertly specific structures on diagrams and models.	447	7.50	1.53	Highly Likely

[a] Response scale: 0 = Not at all likely – 9 = Completely likely
[b] Interpretive scale: 0 - .99 Not at all likely, 1.00 – 2.40 = Slightly likely, 2.41 – 3.80 = Somewhat likely, 3.81 – 5.20 = Moderately likely, 5.21 – 6.60 = Substantially likely, 6.61 – 8.00 = Highly likely, 8.01 – 9.0 = Completely likely

To further summarize the information regarding the likelihood of achieving learning outcome dimension of outcome expectancy, the researcher used factor analysis to determine if primary underlying constructs could be identified in the scale. The factor analysis conducted used the principal components extraction procedure with varimax rotation.

Prior to conducting the planned factor analysis, the researcher examined the cases-to-variable ratio (49.7:1), which exceeded the cases-to-variable ratio recommended

(minimally 5:1) by Hair and others (2006). A review of the anti-image correlation matrix revealed measures of sampling adequacy all above the 0.5 threshold. Furthermore, a Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was conducted and factor analysis calculations revealed a KMO value of 0.94. KMO values above 0.5 determine sampling to be adequate (University of New Castle Upon Tyne, 2006). Additionally, a Bartlett's Test of Sphericity was performed to test the hypothesis that the variables in the population correlation matrix are uncorrelated. The strength of the relationships between variables were found to be strong and acceptable for factor analysis based on the results of this test ($X^2_{36,\ n=447,} = 3286.38, p<.001$) (University of Newcastle Upon Tyne, 2006).

After determining that the data was adequate for completing an exploratory factor analysis, the next step in conducting the test was to determine the number of factors to be extracted from the scale. The researcher used a combination of the latent root criterion and the scree test criterion to make this decision. When the factors were examined, the number of factors was judged to be one. Subsequently, the researcher examined the loadings for the one model for the likelihood scale and it was found to be statistically acceptable. The one factor solution was selected by the researcher since this model was determined to be conceptually most interpretable.

The factor identified in the scale was labeled by the researcher as Learning Outcomes Likelihood, and it included all items. A total of nine items with loadings ranging from a high of .88 to a low of .77 explained 70.1% of the overall variance in the scale. The results of the factor analysis including the factor, the percentage of variance explained, and the factor loading for each of the items is presented in Table 12.

TABLE 12

Factor Analysis of Likelihood of Achieving Learning Outcomes Scale among Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Factor: Likelihood of Achieving Learning Outcomes (70.1% of variance explained)	Factor Loading
I will be able to analyze body systems and organs in terms of the details of their structure.	.88
I will acquire a thorough knowledge of the structural organization of the human body and become proficient in describing the functional aspects of gross anatomy.	.87
I will understand and be able to apply the clinical relevance of anatomic structures.	.86
I will understand the structural relationships between individual parts that form an integrated whole.	.84
I will understand the "big picture" of how the anatomic structures work together.	.83
I will understand selected clinical disorders that arise from abnormalities in structure.	.83
I will learn the anatomical structures and concepts that will help me to succeed in my college program.	.81
I will be able to identify expertly specific structures on diagrams and models.	.79
I will become fluent in the terminology and vocabulary of gross anatomy.	.77

Finally, an overall likelihood score was computed for the study participants. Based on the results of the factor analysis, this score was defined as the mean of the nine items in the Outcome Expectancy – Likelihood scale. The overall mean likelihood score was 7.79 (SD = 1.22) which is classified using the researcher established interpretive scale

as “Highly Likely.” The individual student likelihood scores ranged from 2.22 (classified as “Slightly Likely”) to 9.00 (classified as “Completely Likely).

Value

To measure the value dimension of outcome expectancy, study subjects were asked to rate the value they placed on nine learning outcomes in human anatomy while enrolled in the course. The nine-item value instrument was designed to measure the perceived value students placed on each item. Responses were reported on a 10-point anchored scale with 0 = “Not at all valuable” and 9 = “Extremely valuable”. Cronbach’s alpha measure of internal consistency was used as a reliability estimate of the Value scale and was determined to be $\alpha = 0.95$. According to Hair, Babin, Anderson, and Tatham (2006) this reliability score is acceptable (0.70 or higher).

To aid in the interpretation of the responses for value students placed on learning outcomes, the researcher established a scale of interpretation as follows: 0 - 0.99 = Not at all valuable, 1.00 – 2.40 = Slightly valuable, 2.41 – 3.80 = Somewhat valuable, 3.81 – 5.20 = Moderately valuable, 5.21 – 6.60 = Substantially valuable, 6.61 – 8.00 = Highly Valuable, 8.01 – 9.0 = Extremely Valuable.

The highest mean rating among the items in the value students placed on the learning outcome scale was for the item “I will understand the ‘big picture’ of how the anatomic structures work together” ($M = 8.72$, $SD = 1.35$) which according to the researcher’s interpretive scale was classified in the “Extremely valuable” category. The item “I will be able to identify expertly specific structures on diagrams and models” had the lowest mean rating of the nine-item value portion of the instrument ($M = 8.06$, $SD = 1.69$) which was interpreted using the researcher’s interpretive scale interpreted as

"Extremely valuable." Overall, all nine items were rated in the "Extremely Valuable." See Table 13 for a presentation of the means, standard deviations, and response classification of each item.

TABLE 13

Value of Achieving Learning Outcomes Reported by Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Item	*N*	*M*	*SD*	*Classification*[a]
I will understand the "big picture' of how the anatomic structures work together.	447	8.72	1.35	Extremely Valuable
I will learn the anatomical structures and concepts that will help me to succeed in my college program.	447	8.55	1.46	Extremely Valuable
I will understand and be able to apply the clinical relevance of anatomic structures.	447	8.51	1,51	Extremely Valuable
I will acquire a thorough knowledge of the structural organization of the human body and become proficient in describing the functional aspects of gross anatomy.	447	8.51	1.47	Extremely Valuable
I will understand the structural relationships between individual parts that form an integrated whole.	447	8.32	1.57	Extremely Valuable
I will become fluent in the terminology and vocabulary of gross anatomy.	447	8.25	1.66	Extremely Valuable
I will be able to analyze body systems and organs in terms of the details of their structure...	447	8.23	1.50	Extremely Valuable
I will understand selected clinical disorders that arise from abnormalities in structure.	447	8.22	1.57	Extremely Valuable (Table cont)

I will be able to identify expertly specific structures on diagrams and models.	447	8.06	1.69	Extremely Valuable

[a] Response scale: 0 = Not at all valuable – 9 = Extremely valuable
[b] Interpretive scale: 0 - .99 = Not at all valuable, 1.00 – 2.40 = Slightly valuable, 2.41 – 3.80 = Somewhat valuable, 3.81 – 5.20 = Moderately valuable, 5.21 – 6.60 = Substantially valuable, 6.61 – 8.00 = Highly valuable, 8.01 – 9.0 = Extremely valuable

To further summarize the information regarding the value dimension of outcome expectancy, the researcher used factor analysis to determine if primary underlying constructs could be identified in the scale. The factor analysis conducted used the principal components extraction procedure with varimax rotation.

Similarly, to the scale that measured likelihood of achieving learning outcomes, the researcher examined the cases-to-variable ratio prior to conducting the planned factor analysis. The cases-to-variable ratio was found to be 49:1 which exceeded the cases-to-variable ratio recommended (minimally 5:1) by Hair and others (2006). A review of the anti-image correlation matrix revealed measures of sampling adequacy all above the 0.5 threshold. Furthermore, a Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was conducted, and factor analysis calculations revealed a KMO value of 0.941. KMO values above 0.5 determine sampling to be adequate (University of Newcastle Upon Tyne, 2006). Additionally, a Bartlett's Test of Sphericity was performed to test the hypothesis that the variables in the population correlation matrix are uncorrelated. The strength of the relationship between variables were found to be strong and acceptable for factor analysis based on the results of the test ($X^2_{36,\ n=447} = 3542.12$, $p<.001$) (University of Newcastle Upon Tyne, 2006).

After determining that the data were adequate for completing an exploratory factor analysis, the next step in conducting the test was to determine the number of factors to be extracted from the scale. The researcher used a combination of latent root criterion and

the scree test criterion to make this decision. When the scree test was examined, the number of factors was judged to be one.

The factor identified in the scale was labeled by the researcher as Learning Outcomes Value and included all nine items. A total of nine items with loadings ranging from a high of 0.88 to a low of 0.78 explained 71.8% of the overall variance in the scale. The results of the factor analysis including the factor, the percentage of variance explained, and factor loading for each of the items is presented in Table 14.

TABLE 14

Factor Analysis of Value Placed on Learning Outcomes by Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Item: Value of Learning Outcomes	Factor
I will understand the structural relationship between individual parts that form an integrated whole.	0.88
I will be able to analyze body systems and organs in terms of the details of their structure.	0.88
I will understand and be able to apply the clinical relevance of anatomic structures.	0.87
I will understand the "big picture" of how the anatomic structures work together.	0.87
I will be able to identify expertly specific structures on diagrams and models.	0.86
I will acquire a thorough knowledge of the structural organization of the human body and become proficient in describing the functional aspects of gross anatomy.	0.83
I will become fluent in the terminology and vocabulary of gross anatomy.	0.82

(Table cont)

I will learn the anatomical structures and concepts that will help me to succeed in my college program.	0.80
I will understand selected clinical disorders that arise from abnormalities in structure.	0.78

Finally, an overall mean Outcome-Expectancy - Value score was computed for the study participants. Based on the results of the factor analysis, this score was defined as the mean of the nine items included in Outcome Expectancy scale. The overall mean value score was 8.37 (SD = 1.30) which is classified using the research established interpretive scale as "Extremely valuable." The individual student value scores ranged from 8.06 (classified "Extremely Valuable") to 8.72 (classified as "Extremely valuable").

Objective Three Results

Objective three of this study was to determine if a relationship exists between self-efficacy and outcome expectancy among students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States.

To accomplish this objective, the researcher used the Pearson product-moment correlation coefficient statistical technique. A correlation was calculated between the Self-Efficacy Score and the score for each of the dimensions of Outcome Expectancy measured in the instrument (Likelihood and Value).

Descriptors developed by Davis (1971) were used to describe the magnitude of the relationship between the variables in this objective. These descriptors and corresponding correlation values include: .00 to .09 = negligible association; .10 to .29 = low

association; .30 to .49 = moderate association; .50 to .69 = substantial association; and .70 or higher = very strong association.

When the relationship between self-efficacy and the likelihood dimension of outcome expectancy was examined, the computed correlation coefficient was $r = .60$ ($p < .001$). This association was described using Davis' descriptors as "Substantial." The nature of this association was such that students with higher self-efficacy scores tended to have higher Outcome Expectancy – Likelihood scores.

Additionally, the relationship between self-efficacy and the value dimension of outcome expectancy was measured using Pearson Product Moment correlation coefficient. This association was also found to be statistically significant ($r = .38$, $p < .001$). Davis' descriptors were also used to describe this association as "Moderate." The nature of this association also indicated that students with higher levels of self-efficacy tended to have higher levels of Outcome Expectancy – Value scores.

Objective Four Results

The fourth objective of this study was to determine if a relationship exists between the following specific psychological characteristics and academic achievement (as measured by final grade received in a human anatomy course) in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Self-Efficacy;

(b) Outcome Expectancy as measured by:

1. Likelihood of meeting learning outcomes
2. Value placed on learning outcomes.

In examining the relationship between final grades and self-efficacy and outcome expectancy, the statistical test used to measure the association was selected based on the appropriateness for the level of measurement of each variable as well as to maximize the interpretability of the results. For these variables the Pearson's Product Moment correlation coefficient was used to measure the association.

When the relationships between final grades and the selected psychological characteristics were examined, the only correlation that was found to be statistically significant was with self-efficacy (r = .12, p = .03) (see Table 15).

TABLE 15

Relationship Between Final Grades in Human Anatomy and Selected Psychological Characteristics of Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Variable	*r*	*N*	*p*[a]
Self-Efficacy	.12	447	.03
Outcome Expectancy – Likelihood	.06	447	.25
Outcome Expectancy – Value	.05	447	.36

[a] Two-tailed significance

This relationship was described using Davis' descriptors as a "Low association" (Davis, 1971). The nature of this relationship was such that students who had higher levels of self-efficacy tended to have higher final grades in the human anatomy course.

When the relationship between final grades and the measures of outcome expectancy (likelihood and value) were examined, neither of the correlations was found to be statistically significant.

Objective 5 Results

The fifth objective of the study was to determine if a relationship exists between the following selected demographic characteristics and academic achievement (as measured by final grade received in a human anatomy course) of students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Gender;

(b) University Classification;

(c) Race;

(d) Father's Level of Education;

(e) Mother's Level of Education;

(f) High School Science Grade Point Average;

(g) High School Grade Point Average;

(h) College Grade Point Average.

An a'priori significance level of .05 was used to determine if the selected demographic characteristics were related to academic achievement. The specific statistical technique for examination of each relationship was selected on the basis of its appropriateness for the level of measurement of the demographic characteristic and to maximize the interpretability of the results presented. Relationships with nominal variable (gender and race) were measured using comparative statistics to provide the reader with the most meaningful presentation of the research findings.

An independent t-test procedure was used to compare final grades by categories of the variable gender. To determine the most appropriate t-test procedure, Levine's Test for

Equality of Variances was used to determine if the data met the assumption of homogeneity of variances. The results revealed no violation of this assumption ($F_{(339)}$ = 1.64, p = .20). Therefore, the t-test was calculated using the pooled variance estimate. No significant difference was found between the mean final grade for males (n = 142, *M* = 80.74, *SD* = 9.94) and the mean final grade for females (n = 199, *M* = 80.77, *SD* = 9.90) (t_{341} = .033, p = .97)

A One-Way Analysis of Variance (ANOVA) statistical technique was used to examine the differences in academic achievement by race of study participants. Levine's Test of Homogeneity of Variance was calculated to determine if group variances were equal. Results of this analysis revealed that the homogeneity of variances assumption was not violated ($F_{(4,334)}$ = .521, p = .72).

When the academic achievement of students was compared by Race the results of the ANOVA revealed no significant differences between students based on their reported race. The highest mean was in the category of Anglo-Americans (*n* = 273, *M* = 81.38, *SD* = 9.11) with the African American race category having the lowest mean (*n* = 29, *M* = 77.16, *SD* = 11.27). (See Table 16).

The six other variables that were examined to determine if they were related to final grades in human anatomy to accomplish this objective were all ordinal in nature.

TABLE 16

Mean Final Grades by Race among Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Race	***N***	***M***	***SD***
Anglo-American	273	81.38	9.11 (Table cont)

Other	14	79.93	10.30
Asian-American	13	78.35	7.97
Hispanic-American	10	78.27	12.30
African-American	29	77.16	11.27

Therefore the Kendall's Tau correlation coefficient was used as the statistical procedure to measure these relationships. The demographic characteristic that was found to have the highest association with final grades in human anatomy was College Grade-Point Average (GPA) ($r = .20$, $p < .001$). The relationship was described as a "Low association" (Davis, 1971). The nature of the association between these variables was such that students with higher college GPA's tended to have higher grades in human anatomy (see Table 17). There was no statistically significant difference in any of the other variables and final grades in human anatomy.

TABLE 17

Relationships Between Selected Demographic Characteristics and Academic Achievement of Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Variable	r^a	***N***	p^b
College GPA	.20	340	<.001
High School Science GPA	.07	343	.09
High School GPA	.07	340	.12
Father's Education	.04	341	.23

(Table cont)

Mother's Education	-.03	343	.51
Classification	-.05	332	.23

[a] Kendall's Tau correlation coefficient
[b] Two-tailed significance

Objective Six Results

Objective six was to determine if a model exists that significantly increased the researcher's ability to accurately explain the variance in final grades received from the following psychological and demographic characteristics of students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 at a research-extensive university in the Southern region of the United States:

(k) Self-Efficacy;

(l) Outcome Expectancy as measured by:

1. Likelihood of meeting learning outcomes
2. Value placed on learning outcomes;

(m) Gender;

(n) University Classification;

(e) Race;

(f) Father's Level of Education;

(g) Mother's Level of Education;

(h) High School Science Grade Point Average;

(i) High School Grade Point Average;

(j) College Grade Point Average.

To accomplish this objective, the researcher used a multiple regression analysis with the following steps used for inputting the independent variables into the analysis.

First, the measure of self-efficacy was entered into the analysis. This variable was entered into the model first due to the fact that a substantial conceptual base exists in the literature to indicate that this variable has an expected influence on the academic achievement of students. Research has shown that self-efficacy holds greater explanatory and predictive power for academic outcomes than many other determinants (Pajares & Miller, 1994; Zimmerman, Bandura, & Martinez-Pons, 1992). The variable self-efficacy was measured in the current study by using the Level of Confidence in Anatomy and Physiology (Witt-Rose, 2003) instrument which was constructed to be domain specific. Following the entry of the self-efficacy variable, outcome expectancy measures (likelihood and value), and selected personal and academic demographic characteristics were entered in a stepwise manner as the second block in the analysis. The reason stepwise entry was selected for these variables was the exploratory nature of the influence that these variables have on students' academic achievement.

The following variables were those entered into the regression analysis using stepwise procedures:

(10) Outcome Expectancy as measured by the two constructs

   a. Likelihood

   b. Value

(11) Gender;

(12) University Classification;

(13) Race;

(14) Father's Level of Education;

(15) Mother's Level of Education;

(16) High School Science Grade Point Average;

(17) High School Grade Point Average;

(9) College Grade Point Average.

In conducting the regression analysis, two of the measures to be treated as independent variables were categorical in nature and therefore had to be prepared as dichotomous variables in preparation for entry into the analysis. These variables included university classification and race. The nominal variable gender is a natural dichotomy; therefore it did not have to be restructured. For the variable gender, male was coded "1" and female was coded "2."

For the categorical variable university classification, each of the four provided response categories was established as a separate dichotomous variable. For example, each respondent was classified as either being a Freshman or not being a Freshman, being a Sophomore or not being a Sophomore, etc. Similarly, race was established as the respondent was either Anglo-American or not Anglo-American, African-American or not African-American, etc.

Step one of the analysis included the researcher's examination of the data for the presence of excessive multicollinearity among the independent variables in the analysis. This was accomplished through examination of the tolerance values and the variance inflation factor (VIF) for the data included in the analysis. The tolerance values ranged from .409 to .990, and the VIF values ranged from 1.01 to 2.44 (see Table 18). Hair, et. al. (1998) indicates that, "A common cutoff threshold is a tolerance value of .10" (p. 193). A tolerance value of .10 would correspond to a VIF of 10.0. Since the tolerance values and the VIF values were within acceptable ranges, the researcher concluded that no

instance of excessive collinearity among the independent variables was evident in the data. Thus the researcher proceeded with the regression analysis.

TABLE 18

Collinearity Diagnostic Measures for the Regression of Final Grades Students Received in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

Factor	Tolerance	VIF
Likelihood	.409	2.444
Value	.549	1.822
Self-Efficacy	.605	1.652
High School Science GPA	.827	1.209
High School GPA	.851	1.176
Anglo-American	.905	1.105
African-American	.916	1.091
Father's Education	.933	1.071
Gender	.957	1.045
Mother's Education	.966	1.036
Hispanic-American	.972	1.028
Senior	.983	1.018
College GPA	.983	1.018
Sophomore	.987	1.014
Junior	.990	1.010
Freshman	.990	1.010
Asian-American	.990	1.010

For descriptive purposes, two-way correlations between factors used as independent variables in the regression are presented in Table 19. College Grade Point Average ($r = .26$, $p < .001$) was the only variable that was found to be statistically significant among the 17 variables.

TABLE 19

Relationship Between Selected Predictor Variables and Final Grades of Students Enrolled in an Undergraduate Human Anatomy Course at a Research Extensive University in the Southern Region of the United States

Variable	*r*	*p*[a]
College GPA	.26	<.001
Anglo-American	.13	.18
Self-Efficacy	.11	.02
African-American	-.10	.21
Junior	.09	.05
Sophomore	-.09	.06
High School GPA	.07	.11
High School Science GPA	.06	.14
Father's Level of Education	.06	.12
Likelihood	.06	.13
Value	.05	.18
Hispanic	-.05	.20
Asian-American	.05	.21
Mother's Level of Education	-.04	.25
Gender	.01	.44

(Table cont)

Senior	.01	.44
Freshman	-.01	.44

Note. N = 334

[a] One-tailed significance

Based on the literature, the independent variable self-efficacy was entered into the regression first. Considered alone, this variable explained 1.2% ($F_{change} = 4.056$, $p = .045$) of the variance in final grades of students enrolled in an undergraduate human anatomy course at a research extensive university. When the remaining variables were entered into the analysis using a stepwise regression method, College GPA entered and explained an addition 6% of the variance of final grades. Combined these two variables explained 7.2% of the variance in final grades of students in an undergraduate human anatomy course.

The nature of the influence of these variables that entered the model was such that students with higher levels of self-efficacy and higher reported college grade point averages tended to make higher grades in human anatomy. Table 20 presents the results of the multiple regression analysis utilizing Final Grades as the dependent variable.

TABLE 20

Multiple Regression Analysis of Final Grades on Self-Efficacy, Outcome Expectancy, and Selected Demographic Variables of Students Enrolled in an Undergraduate Human Anatomy Course at a Research-Extensive University in the Southern Region of the United States

ANOVA

Source of Variation	**Df**	**MS**	**F-ratio**	**P**
Regression	2	1982.365	12.804	<.001
Residual	331	83.535		
Total	333			

(Table cont)

Model Summary

Model	R^2 Cumulative	R^2 Change	F Change	Sig. F Change	Coefficients Beta
Self-Efficacy	.012	.012	4.056	.045	.110
College GOPA	.072	.060	21.304	.000	.246

Variables not in the Equation

Variables	T	Sig.t
Likelihood	-.323	.732
Value	-.103	.918
Gender	-.466	.641
Senior	.060	.952
Junior	1.579	.115
Sophomore	-1.411	.159
Freshman	-.482	.630
Anglo-American	1.185	.237
African-American	-.635	.526
Asian-American	-.959	.338
Hispanic	-.517	.605
Father's Level of Education	.071	.944
Mother's Level of Education	-1.522	.129
High School GPA	- .681	.496
High School Science GPA	-1.052	.294

CHAPTER 5

SUMMARY

Summary of Purpose and Specific Objectives

The primary purpose of this study was to determine the influence of selected demographic and psychological characteristics on the academic achievement of students enrolled in an undergraduate human anatomy course at a research-extensive university in the Southern region of the United States. The dependent variable in this study was the academic achievement of students enrolled in a human anatomy course at a research-extensive university in the Southern region of the United States for the fall 2005 and spring 2006 semesters as measured by the final grade received in the human anatomy course.

The following specific objectives were formulated to guide the research study:

1. To describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States on the following demographic and academic characteristics:

(a) Gender;

(b) University Classification;

(c) Race;

(d) Father's Level of Education;

(e) Mother's Level of Education;

(f) High School Science Grade Point Average;

(g) High School Grade Point Average;

(h) College Grade Point Average;

(i) Academic Achievement as Measured by Final Grade.

2. To describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States on the following selected psychological characteristics:

(a) Self-Efficacy;

(b) Outcome Expectancy as measured by:

1. Likelihood of meeting learning outcomes

2. Value placed on learning outcomes.

3. To determine if a relationship existed between self-efficacy and outcome expectancy among students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States.

4. To determine if a relationship existed between the following specific psychological characteristics and academic achievement (as measured by final grade received in a human anatomy course) in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Self-Efficacy and Final Grades;

(b) Outcome Expectancy and Final Grades as measured by

1. Likelihood of meeting learning outcomes

2. Value placed on learning outcomes.

5. To determine if a relationship existed between the following selected demographic characteristics and academic achievement of students enrolled in an undergraduate human

anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Gender;

(b) University Classification;

(c) Race;

(d) Father's Level of Education;

(e) Mother's Level of Education;

(f) High School Science Grade Point Average;

(g) High School Grade Point Average;

(h) College Grade Point Average.

6. To determine if a model existed that significantly increases the researcher's ability to accurately explain the variance in academic achievement (as measured by final grade received in a human anatomy course) from the following psychological and demographic characteristics of students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States:

(a) Self-Efficacy;

(b) Outcome Expectancy as measured by:

1. Likelihood of meeting learning objectives

2. Value placed on learning outcomes;

(c) Gender;

(d) University Classification;

(e) Race;

(f) Father's Level of Education;

(g) Mother's Level of Education;

(h) High School Science Grade Point Average;

(i) High School Grade Point Average;

(j) College Grade Point Average.

Summary of Methodology

The target population for this study was defined as students enrolled in an undergraduate human anatomy course at research-extensive universities in the United States. The accessible population for this study was defined as undergraduate students enrolled in a semester-long human anatomy course at a research-extensive university in the Southern region of the United States during the fall 2005 and spring 2006 semesters. The sample included all students in the accessible population who agreed to participate when requested to do so. The accessible population was 535 students enrolled in human anatomy in the fall 2005 and spring 2006 semesters. Usable data was retrieved from 449 (84.1%) of the defined accessible population.

Three instruments were used to collect data on specific demographic, academic, and psychological variables related to this study. The specific variables measured were selected after an extensive review of related literature on demographics, academic self-efficacy, and academic outcome expectancy.

Data on the specific demographic and academic variables related to this study were collected from the accessible population of students enrolled in a human anatomy course at a research-extensive university in the Southern region of the United States. Approval for implementation for the study was obtained from the Louisiana State

University Institutional Review Board (IFB) for Homan Subject Protection prior to the initial study. Final assigned grades were retrieved from the professor of record for each of the two semesters, fall 2005 and spring 2006. Final grades were based on a compilation of all test grades received in class by the participating students and the average of five exams.

Summary of Major Findings

The major findings of this study are discussed by objective.

Objective One

The objective was to describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States on certain demographic and academic characteristics.

Demographic and Personal Information

Of the 450 students enrolled in human anatomy, there were more females (n = 269, 60.4%) than males (n = 176, 39.2%). Juniors accounted for the largest group of students (n = 174, 40.1%) enrolled in the class followed by sophomores (n = 149, 34.3%). The majority of enrolled students were Anglo-American (n = 347, 79.0%) with African-American (n = 43, 9.8%) representing the second most frequently reported race. The largest group of students (n = 143, 31.8%) reported their father's level of education as having a college degree. Likewise, the largest group of students (n = 141, 31.5%) indicated their mother' highest level of education as having a college degree.

Academically, the majority of students (n = 298, 66.7%) had a high school grade point average in the range of 3.51 – 4.0. Regarding the reported high school science grade

point average, 239 students (54.0%) said they had a 3.51 – 4.0. When reporting college grade point average, the largest group of student (n = 159, 35.9%) reported that this measure was in the 3.1 to 3.5 category.

Objective Two

The second objective of this study was to describe students enrolled in an undergraduate human anatomy course during the fall 2005 and spring 2006 semesters at the study institution on selected psychological characteristics.

Self-Efficacy

Participants were asked to respond to 15 items regarding their level of confidence on a 5-point Likert-type scale with 1 = "strongly disagree" and 5 = "strongly agree." When asked to indicate their level of self-efficacy in human anatomy, the students reported an overall level of "agreement" (n = 449, *M* = 4.13, *SD* = .49) with the combined 15-item self-efficacy scale. Respondents reported they had the highest level of agreement (n = 449, *M* = 4.63, *SD* = .61) on the item worded "I believe that if I exert enough effort, I will be successful in anatomy." Using the researcher's established interpretive scale, this item was categorized as "Strongly Agree." The item "I don't think I will get a good grade in anatomy" received the lowest mean rating (n = 449, *M* = 1.57, *SD* = .81) indicating the students disagreed with this statement. Overall, two of the 15 items were classified in the "Strongly Agree" category, 8 were classified in the "Agree" category, 2 items were in the "Neutral" category, and 3 were in the "Disagree" category.

Outcome Expectancy

Likelihood

Using a nine-item instrument, the researcher asked students to respond to the likelihood

they would accomplish the learning objectives and the value they placed on each of the nine items. Responses for Likelihood were reported on a 10-point anchored scale with 0 = "Not at all likely" to accomplish the learning objective and 9 = "completely likely' that the objective would be accomplished. Similarly, responses for the Value portion of the instrument were on a ten-point scale with 0 = "Not at all valuable" and 0 = "Extremely valuable.''

The highest mean score of the nine items measuring the students' likelihood of meeting the learning outcomes was the item " I will understand the 'big' picture of how the anatomic structures work together" (n = 446, *M* = 8.21, *SD* = 1.39) which based on the researcher's established interpretive scale was described as "Completely likely." The item "I will be able to identify expertly specific structures on diagrams and models" had the lowest mean of the nine items (n = 447, *M* = 7.50, *SD* = 8.00). According to the interpretative scale, this item was considered "Highly likely" to be accomplished. Finally, the overall likelihood score reported for the likelihood of students accomplishing the learning outcomes in anatomy ranged from a minimum of 2.22 to a maximum of 9.0 (*M* = 7.79, *SD* = 1.22).

Value

Using the same nine-item scale students were asked to place a value on each item with 0 = "Not at all valuable" to 9.0 = "Extremely Valuable." The highest mean score for the value students placed on the learning outcomes was the item "I will understand the 'big picture' of how the anatomic structures work together" (n =447, *M* =8.72, *SD* = 1.35) which according to the researcher's interpretive scale was classified in the "Extremely valuable" category. Item "I will be able to identify expertly specific structures on

diagrams and models" had the lowest mean of the nine-item portion of the instrument (n = 447, *M* = 8.06, *SD* = 1.69) interpreted as "Completely likely." Overall the value students placed on the nine items fell in the "Completely valuable" category (n = 447, *M* = 8.37, *SD* = 1.30).

Objective Three

Objective three was to determine if a relationship existed between self-efficacy and outcome expectancy among students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States.

The results of the Pearson product-moment correlation coefficient found a significant positive correlation between self-efficacy and the likelihood students would accomplish the learning objectives stated in the survey ($\underline{r}$ = .60, $\underline{p}$ = .01). Additionally, self-efficacy was found to be significantly positively correlated with the value students placed on the learning objectives ($\underline{r}$ = .38, $\underline{p}$ = .01).

Objective Four

The fourth objective of this study was to determine if a relationship existed between specific psychological characteristics and academic achievement in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States. These variables were:

(a) Self-Efficacy and Final Grades

(b) Outcome Expectancy and Final Grades with Outcome Expectancy measured by:

1. Likelihood of meeting learning outcomes

2. Value placed on learning outcomes.

Using a Pearson's product moment correlation coefficient the researcher found a significant positive correlation to exist between self-efficacy and final grades (r = .12, p = .03). The likelihood students would achieve the learning outcomes was not significantly correlated with final grades. Similarly the value the students placed on the learning outcomes was not significantly correlated with final grades.

Objective Five

The fifth objective of this study was to determine if a relationship existed between selected demographic characteristics and academic achievement (as measured by final grades) of students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 semesters at a research-extensive university in the Southern region of the United States. These eight variables were:

(a) Gender;

(b) University Classification

(c) Race;

(d) Father's Level of Education;

(e) Mother's Level of Education;

(f) High School Science Grade Point Average;

(g) High School Grade Point Average;

(h) College Grade Point Average.

Review of all relationships examined revealed a significant relationship between study participants' college grade point average and their final grade in human anatomy

(r = .20, p = <.001). There were no significant relationships found between any other of these listed variables and final grades.

Objective Six

Objective six was to determine if a model existed that significantly increased the researcher's ability to accurately explain the variance in final grades received from specific psychological and demographic characteristics of students enrolled in an undergraduate human anatomy course in the fall 2005 and spring 2006 at a research-extensive university in the Southern region of the United States. These characteristics were:

(a) Self-Efficacy;

(b) Outcome Expectancy as measured by:

1. Likelihood of meeting learning outcomes

2. Value placed on learning outcomes;

(c) Gender;

(d) University Classification;

(e) Race;

(d) Father's Level of Education;

(e) Mother's Level of Education;

(f) High School Grade Point Average;

(g) College Grade Point Average;

(h) High School Science Grade Point Average.

Using a hierarchical regression analysis, the researcher entered the variable self-efficacy first due to the substantial conceptual base that existed in the literature to indicate

its influence on the academic achievement of students. Following the entry of the variable self-efficacy, outcome expectancy values, personal and academic demographic characteristics were entered in a stepwise manner as the second block in the analysis. Due to the exploratory nature of the influence that these variables might have on students' academic achievement, the researcher chose the stepwise regression method of analysis.

When considered alone, the variable self-efficacy explained 1.2% of the variance of final grades of students enrolled in an undergraduate human anatomy course at a research-extensive university. When college grade point average was added to the analysis, an additional 6.0% of the variance of final grades was explained. Combined these two variables explained 7.2% of the variance of final grades of students in an undergraduate human anatomy course.

Conclusions, Implication, and Recommendations

Based on the findings from the study, the researcher has derived the following conclusions, implications, and recommendations:

Conclusion One

The majority of students who enrolled in human anatomy were female. This conclusion is based on the findings that 60.4% of the students enrolled were female and 39.6% were male. The higher enrollment of female students is consistent with Bleaker and Jacobs (2004) research which found there has been an increase of women indicating interest in areas of life sciences.

This enrollment status within the human anatomy class is of importance to the overall national shortage of medical personnel especially in allied health fields. The projected shortfall of women in science prompted the National Research Council (1996)

to examine how greater participation of women in science could occur. Furthermore, many propose that if the number of women committed to medical professions does not increase, the nation will be unable to meet its technical and scientific needs (National Science Board, 1986). This shortage of health care professionals is strongest in the area of registered nurses, as they represent the largest group of health care workers in this country (State of the Health Care Workforce, 2000). With the national shortage of nurses presently at 6%, the statistic is predicted to double by 2010. This is an outcry for educators and students to consider nursing as a profession. Traditionally nursing has been predominantly female but more males are recognizing the financial incentive of the career and entering the profession. Students in this study were not asked to declare their major, therefore, there are no statistics indicating what these students' professional intentions were. It would be naive to consider all students in this study were considering a profession in the field of medicine, but enrollment and successful completion of the course are necessary to alleviate some of the strain on the health care system.

It is evident from this study that females are demonstrating an interest in the subject of human anatomy or some professional area that requires the course in the academic curriculum. Based on these findings, the researcher recommends because of the expected shortfall of medical personnel, it is imperative that this representation of women in the field of science remain constant. Continued recruitment regardless of gender should continue to lessen the gap between supply and demand in health care.

Personal contact with students by representatives from the allied health professions could promote an interest in students' pursuit of a career path. On university campuses, there are numerous opportunities for professionals to share their occupational knowledge

with students. For example, student organizations specifically for pre-med, dentistry, and physician's assistant programs exist whose members are students who have declared these fields as their career goal. Through these organizations, a forum of professionals could deliver the message about health care and the opportunities that exist. This forum could be a campus-wide program or even be set up to accommodate a large human anatomy class. Secondly, it is of importance for this information to be made available to students simultaneously with an anatomy professor who can answer any questions regarding the course content. If students have personal knowledge of a faculty member this relationship, albeit superficial, they are more likely to be more confident about their chances of success in the course.

Conclusion Two

Most of the students enrolled in human anatomy in this study were either Sophomores or Juniors. These two classifications accounted for 74.4% of the entire class enrollment during the fall 2005 and spring 2006. Due to the academic content and comprehensive nature of the material, students are more likely to delay taking human anatomy until their second year in college, thus the low enrollment of freshman. Also, students are often required to complete certain prerequisites before enrolling in an upper level science class making it difficult to take an anatomy course prior to their sophomore year in college. Seniors in college usually have declared a major and are enrolled in courses specific to that discipline. Additionally, because human anatomy serves as a foundation for upper level medically-oriented curriculum, most students by their senior year have completed the course, accounting for the lower percentage of seniors enrolled in the class.

There are two issues that need addressing about the 449 participants in this study. First, should or could the number of students enrolled be increased in order to help increase the number of students entering the health care profession? With class-size an issue at most research-extensive universities, increasing numbers may not be an option. Similarly, if the undergraduate numbers are increased, are there enough professional schools with openings to admit these aspiring healthcare workers? And secondly, the basis of this study is the successful completion of human anatomy. With class size increasing, it is becoming ever so difficult to recognize the academic characteristics of classes, leaving educators with little flexibility in the delivery of the material. Smaller classes lend themselves to more dialogue between student and instructor giving the instructor an opportunity to not only know the students more personally but allow for a better understanding of the students' academic ability. By recognizing early students who may indicate some low level of self-efficacy, the instructor could encourage the student to seek academic assistance. By doing so, students who do enter anatomy with low levels of self-efficacy could gain the needed confidence to continue and succeed in the course.

These issues would be beneficial to academic centers whose charge it is to tutor and help identify students' academic concerns. Linnenbrink and Pintrich (2003), Karabenick & Knapp (1991), Newman (1990), and Ryan and Pintrich (1997) all concur that it is predictable to expect that students who have low academic self-efficacy are less likely to seek help and conversely students with high levels of self-efficacy are more likely to seek help, persist, and try. Based on the findings of this study and this available research, the researcher recommends future research on the value of interventions in students with low self-efficacy in human anatomy.

Conclusion Three

There was little diversity in the enrollment statistics of the students enrolled in the undergraduate human anatomy courses. This conclusion is based on the finding that the majority of the students who reported their race were Anglo-American (79.1%).

The low enrollment of minorities should be of concern, for the issue is potentially linked to graduation rates, fairness in student selection, campus climate, and composition of faculty and staff (Perna, 2000). This conclusion is corroborated by a study by Bonous-Hammarth (2000), which reported the flow out of and into science, mathematics, and engineering majors among African-American, American-Indian, and Hispanic students. She found that these groups experienced greater attrition from these majors than did whites. Another possible issue is one identified by Johnson (2000), who reported that minority students who were enrolled in a nursing program in a research-extensive university felt isolated from both faculty members and fellow students.

Diversity is a key ingredient of research-extensive universities and should help define what the university does and who it educates. Recruitment of minorities is essential and paramount to increasing the numbers for future healthcare professionals. Therefore, these results would be beneficial to enrollment managers in an effort to learn what factors, if any, have been and/or would be effective in recruiting minorities.

Based on this conclusion, the researcher recommends a qualitative study be conducted that would delve into the problems minorities may encounter while pursuing a degree in the medical field. With qualitative research the results will help identify the reasons for minorities leaving or not pursuing careers in the health care. Furthermore, the researcher recommends universities and professional programs in the health care realm,

examine their faculty race ratios. If minorities could see and interact with a more diverse representation in healthcare especially at the administrative and faculty level, there would be a higher level of interest as well as a better sense of belonging.

Conclusion Four

Students enrolled in an undergraduate anatomy course at the research-extensive university used in this study had high levels of self-efficacy. This conclusion is based on the responses given by the students on the instrument used to measure self-efficacy.

Of the 15-item self-efficacy scale, the item that respondents had the highest level of agreement was "I believe that if I exert enough effort, I will be successful in anatomy" ($M = 4.63$, $SD = 0.61$). This item was classified using the researcher's established interpretive scale in the "Strongly Agree" category. Equally as important is the fact that students overall disagreed with the item "I don't think I will get a good grade in anatomy" ($M = 1.57$, $SD = .81$). The overall self-efficacy scores ranged from a minimum of 2.13 to a maximum of 5.00 ($M = 4.13$, $SD = .49$).

Self-efficacy is sometimes referred to as perceived ability and is concert with the confidence people have in their abilities that they can successfully perform a particular task (Bandura, 1997). Researchers such as Smist (1993), Olsen and House (1997), and Fenci & Schell (2005) have used this psychological factor to help predict academic outcomes in disciplines as chemistry, physics, and mathematics.

The reasons this finding is so critical to this study is because there does seem to exist an assumption that the cognitions that individuals create and develop and hold to be true about themselves form the very foundation of human agency which are vital forces their success or failure in academics (Pajares, 1994). Thus self-efficacy for academic

tasks in anatomy is integral to pursuing avenues which could help more students succeed, thus yielding more qualified students to help fill the void in medical fields.

Although most students identified themselves in this study as believing that effort would result in success in anatomy, there were respondents who doubt that even a strong effort may not yield success. Pajares and Miller (1994) suggested that self-efficacy may hold greater explanatory and predictive power for academic outcomes than many other determinants. Therefore, if students that rate themselves as having low self-efficacy can be identified early there are possible interventions that could help escalate their confidence in successful completion of anatomy. For example Johnson, Johnson, Pierson and Lyons (1985) found that peer tutoring offers students an opportunity to learn vicariously through others, sometimes resulting in enhanced self-esteem.

The researcher recommends that even though the overall level of self-efficacy for the students in this study was high, students be asked to respond to these same items at intervals throughout the semester. One possible plan for this recommendation would be to distribute the instrument the first day of class before any discussion about class objectives or grading. After test one, have the students again respond to the same fifteen self-efficacy items and then compare the results. After three of the five exams have been given repeat the survey to see if the levels of self-efficacy are increasing or are the levels waning due to lower than expected exam scores. Low levels of self-efficacy in human anatomy may have detrimental effects on the students' ability to master other academic subjects. So by identifying students who are trying to academically succeed with low levels of self-efficacy, educators are helping to improve success rates of students in anatomy and potentially in the overall academic performance.

To truly understand the complexity of self-efficacy and its effect on students, all students, regardless if they make a decision to withdraw from the class or not, need to complete the self-efficacy scale. This becomes important especially for those students who choose to withdraw from the class before the semester end. By examining specifically those students, researchers could begin to use interventions to help slow the attrition rate in human anatomy. There are so many factors that can be attributed to success and failure in a college course. Being able to identify those factors inherently responsible for withdrawal from anatomy helps position institutions of higher learning to address the issues with needed resources to decrease the number of students who withdraw from the class due to a feeling of helplessness and frustration.

Conclusion Five

Outcome expectancy for students enrolled in human anatomy was high.

Another integral part of this study was respondent's rating of the outcome expectancy in human anatomy. Outcome expectancy is a person' estimate that a certain behavior will produce a resulting outcome. Unlike self-efficacy, outcome expectancy is more of a belief about the consequences of a behavior. In this study outcome expectancy was measured using two constructs, likelihood of obtaining nine learning outcomes, and the value students placed on the same nine learning outcomes.

The overall mean likelihood score was 7.79 (SD = 1.22), which is classified using the research established interpretative scale as "Highly Likely." The overall mean value score was 8.37 (SD = 1.30), which is classified using the research established interpretative scale as "Extremely valuable." The highest mean rating of the nine items measuring the students' likelihood of meeting the learning outcomes was item "I will

understand the 'big picture' of how the anatomic structures work together " (M = 8.21, SD = 1.39). Using the researcher's interpretive scale means the students thought the likelihood of achieving a specific outcome as "Completely Likely."

The highest mean rating for the value students placed on the learning outcomes was the item "I will understand the 'big picture' of how the anatomic structures work together" (M = 8.72, SD = 1.34). Using the researcher's interpretive scale puts this learning outcome in the "Extremely Valuable" category.

Considering the results of the Outcome Expectancy instrument used in this study, it could be concluded students believed they would understand the subject of anatomy and the application necessary for a complete understanding of the subject matter. Participants rated the same item as the most valuable of the nine learning outcomes. This result is corroborated by Eccles (1987), Feather (1988), and Wigfield and Eccles (1992, 2001) work that linked expectancy-related and task value beliefs. In these models, expectancies and values are proven to be positively linked to each other.

Furthermore, since outcome expectancy is an interaction of an individual's expectations of obtaining a particular outcome and the extent to which the individual assigns value to the possible outcome (Rogers & Brawley, 1991), these results manifest themselves to have important implications for further research. This interaction should be valued in research focusing on student motivation and academic performance. Therefore, if an educational outcome is thought to be unattainable or worthless, students will not be motivated (Bandura, 1995). It can be concluded that students are motivated to act if the academic goal is valued and believed to be attainable. It is thus recommended that educators inspire and motivate students to find value in the content of the class which

develops a desire to learn and succeed on the part of the student. Additionally, by identifying those students who may enter the course with preconceived opinions about their own ability and with low expectations, college instructors could help dispel this negativity and increase the numbers of student successfully completing the course.

Conclusion Six

Self-efficacy and Outcome Expectancy are positively related.

This conclusion is based on the positive significant correlation found between self-efficacy and the likelihood students would accomplish the learning objectives stated in the instrument used to measure outcome expectancy (r = .60, $\underline{p}$ = .01). Additionally, self-efficacy was found to be positively significantly correlated with the value placed on the learning objectives (r - .38, $\underline{p}$ = .01).

These results are consistent with findings of other studies in the literature, Linnenbrink and Pintrich (2003) found that interest in a task, thinking that a task is important, and feeling excited about it lead to an increase in student engagement and learning. Similarly, Pintrich and Schunk (1996) found that the construct of learned helplessness is related to self-efficacy; within self-efficacy theory the concept is referred to as low outcome expectation. Therefore, when students believe there is not a relationship between how hard they study and performance in school, learned helplessness is present.

These findings are relevant because of the effort that needs to be set forth to identify students with low self-efficacy because of the magnitude of the influence it has on academic outcome expectancy. Since self-efficacy is related to a careful estimation of one's abilities, then as a society there is a need to look at helping students at an earlier age

become more confident in their ability to master science. Baldwin, Ebert-May, and Burns (1999) pointed out the importance of self-efficacy in learning difficult subjects such as the sciences. Eccles' (1993) identified four aspects of valuing of science using an expectancy-value model. What emerged from this research is that of the four components, the most critical is the cost. Cost in that study is operationalized as the worthwhileness of time and effort required for learning science.

Therefore, the researcher recommends that since students enter courses with varying levels of fear and anxiety, educators, enrollment managers, recruitment administration collectively find ways to help dispel some of the academic angst in future students. A possible outcome of these efforts would be an increase in the number of students who enter anatomy with higher self-efficacy and helping students succeed in their academic and career paths.

The researcher also recommends that anatomy researchers examine how the students are evaluated. Some universities now exclusively use computer testing, which for some students is problematic. Alternative ways of evaluation could help some students succeed, thus increasing their self-efficacy. Administratively, universities could assign a unit of academic advisors who are trained to identify and improve self-efficacy of students who are enrolled in the more difficult courses taught on their respective campuses. A survey of graduating students in certain disciplines could be asked to identify three classes that they recognized as having been the most difficult classes in which they were enrolled while in college. The results of this survey could be examined for commonalities, and those are the classes that would receive academic assistance for the students.

Conclusion Seven

There is a positive relationship between self-efficacy and final grades. This conclusion is based on the finding that a significant positive correlation was found to exist between self-efficacy and the final grade achieved in human anatomy (r = .12, $\underline{p}$ = .03).

This finding is consistent with studies by Lent, Brown, and DeGroot (1990), Witt-Rose (2003), and Smist and Owen (1994) who reported that self-efficacy contributed significantly to the prediction of science achievement. Witt-Rose (2003) showed a highly significant positive correlation between self-efficacy and midterm grades as well as final grades. Numerous researchers (Pajares, 1996, Graham & Weiner, 1996, Gore, 2006) have reported self-efficacy to be a strong predictor of college performance.

The researcher recommends further study to measure self-efficacy of students who enroll in human anatomy and decide to withdraw from the course. It is probable that students with a low level of confidence in their ability to succeed in anatomy thus influencing their motivation and academic performance in this subject matter. The findings of this study are congruent with Bandura's (1977, 1986) theory that utilization of self-efficacy seems to be a particularly salient means of measuring students' academic self-efficacy. Therefore, it would be valuable to know the self-efficacy of students prior to their entering such a difficult course. The information could be attained through use of the instrument used in this study, results given to the professor of record and to academic services for use in identifying students in need of tutoring or other interventions to bolster their confidence in the course. Additionally, it is suggested that research-extensive universities reconsider class size when assigning students to courses. Smaller class sizes

for students with low self-efficacy would make for a more comfortable and conducive learning environment, especially for students who show signs of low self-efficacy.

As peer tutoring has shown to be a significant intervention for some academic disciplines, the researcher recommends that universities fund a program for students who are willing to tutor their classmates. If there is a financial incentive, students are much more likely to engage in the program. Similarly students who have successfully completed anatomy could be recruited to speak to human anatomy classes and address issues that students may have about the course. Any apprehension that may be taking place on the part of the currently enrolled student may disappear after realizing the obstacles are ones that can be overcome and completion of the course is attainable.

It can be concluded that academic self-efficacy beliefs play a role in predicting college students' academic performance and persistence giving more reason to consider further research with students who disengage with the subject. This study has continued to refer to the present shortage of health care workers and has given statistics of more trouble with caring for the affirmed and medically impaired citizenry in the future. How better to alleviate this strain on the nation's health care than to educate more students in the professions that are so sorely needed? In order for this to be an option, students must be able to successfully complete a college-level human anatomy course, and these results show that not all students are accomplishing this feat. Since self-efficacy has an influence on final grades in anatomy, the researcher recommends the self-efficacy instrument be an integral part of the course from beginning to end. Students who do successfully complete the course will, according to the results of this study, show high levels of self-efficacy but conversely the students who have low levels will be in need of academic assistance. Early

intervention in such a course could help improve the number of students who not only finish the course but succeed in making a grade of B or better.

Also, the researcher recommends that educators, administrations, and research dollars all be directed toward consideration of what this study means to finding ways to successfully engage more students in human anatomy. There needs to be more funding for more educators, recruitment of graduate students to study within the specific discipline of human anatomy, and more government dollars to find class space for the growing number of students it will take to begin to see some relief in the shortage of allied health professionals.

Conclusion Eight

Grades and Outcome Expectancy were not found to be related.

This conclusion is based on the relationship between likelihood and final grades ($r = .06$, $p = .25$) and a non-significant finding of a non-significant relationship between value and final grades ($r = .05$, $p = .36$).

For the purposes of this study, outcome expectancy was measured by two constructs, the likelihood the student would attain the learning objectives and the value placed on the learning objectives. From the review of the related literature, studies by Maddux, Norton, and Stoltenber (1986), Schunk (1991) and Landry (2003), postulated academic outcome expectations influence the development both of interests and of goals, although contextual influences may also play a role. It may be for this reason that the results of this study revealed no significant correlation between either likelihood or value and final grades. There may be other factors in the students' personal, social, or academic lives that influenced their responses on the instrument measuring likelihood and value.

Additionally, those students whose final grades were not available due to their withdrawing from class may have placed lower ratings on likelihood and value thus causing poor early grade performance and resulting in the need to withdraw from the class.

Since human anatomy is the capstone course for students seeking professions in the medical field, the researcher suggests pre-testing of students enrolled in human anatomy. Those units on the campus of a research –extensive university whose charge it is to provide academic assistance to its students, should be given the funding to enable this testing to take place. Testing students prior to the course would give the instructor, the University Department, and administrators a far better understanding to whom the academic assistance should be directed. It is the opinion of the researcher that contrary to the results of the outcome expectancy and final grades results of this study an intervention of this magnitude would increase the success rate of students enrolled in human anatomy.

Conclusion Nine

Gender does not influence final grades received in human anatomy.

This conclusion is based on the finding that the final grades of the males and females enrolled in the human anatomy class were not significantly different ($t_{341} = .033$, $p = .97$).

These results do not concur with numerous studies by researchers as Smist, Archamault, and Owen (1997), DeBacker and Nelson (2000), and Cavallo and Potter (2004) who found that especially in the discipline of science males had higher self-efficacy and outcome expectancy and performed academically better than their female peers. Additionally, a study by Kahle and Meece (1994) found that gender differences in

science self-efficacy emerged as early as middle school and continued to be manifested throughout college. Further, Kahle, Parker, Rennie, and Riley (1993) suggested that the gender effect is manifested when expectations, interactions, or measured achievements such as grades are related to a student's sex rather than based upon her or his potential.

Based on the findings of this study, the researcher postulates that gender is becoming much less a significant predictor of success in science fields. As the role of females continues to change in the workforce, more diversity will be seen in such areas of engineering and science. Recruitment of women into these fields and others must continue to ensure female representation and because gender was not significantly related to final grades academic ability does not seem to show gender bias. Strong support for no correlation between gender and grades in this study can be attributed to Ely's (1995) suggestion that gender identity is an ongoing socially constructed phenomenon and implies that gender is malleable on the basis of changes in social milieu.

As stated before, the problem with the shortage of allied health professionals is not one of gender, for both need to be represented in order to address this serious social problem.

Conclusion Ten

Race does not influence final grades in human anatomy.

This conclusion is based on the finding of the study that no significant difference was found in grades between Anglo-Americans, African Americans, Hispanic Americans, Asian Americans, and Others ($F_{(4, 334)} = 1.764$, $p = .14$).

As with gender, race did not emerge as being significantly related to final grades in the course of human anatomy. While the researcher finds this result positive, it is

inconsistent with research by Garibaldi (1998) and Walker and Satterwhite (2002). Their research found that African-Americans perform academically below Caucasian students. Britner and Pajares (2001) found that race was the only variable contributing to the prediction of science achievement.

An explanation for race and academic achievement being related is the sweeping changes that have been made in answer to the challenge of institutions of higher education to recruit, prepare, and graduate students who are equipped to succeed. In light of this advance in diversity, research-extensive universities must continue to make academic services accountable for minority student retention and graduation.

The findings of this study are in contrast to those found by Hammarth (2000), who found a greater attrition from the sciences among African-American, American-Indian, and Hispanic students. Additionally, because the enrollment of these races were not well represented in this study's population, it would be of interest to research race and academic achievement in human anatomy with a population with a more diverse racial representation. Therefore, the researcher recommends that enrollment managers, financial aid personnel, and science educators incorporate strategies to further enhance the recruitment and success of minority students.

Conclusion Eleven

Parent's level of education was not related to students' final grades.

This conclusion was based on the findings of the study that no significant relationship was found between either mother's (r = -.03, p = .51) or father's (r = .04, p = .28) level of education and the final grades received by students in human anatomy.

Although there is literature that suggests otherwise (Campbell, Hombo, & Mazzeo, 1999), in this study there was no relationship between parental level of education and final grades. The finding of this study as it relates to parent's level of education supports the findings of Nuijens (2000) study. Results of her research found although parent's education was hypothesized to be a strong predictor of adolescent academic performance, this variable did not emerge as significant.

Conclusion Twelve

There is a positive relationship between college grade point average and final grades achieved in an undergraduate human anatomy course.

This conclusion is based on the significant positive relationship found between college grade point average and final grades in human anatomy ($r = .20$, $p < .001$).

This is consistent with findings of other studies in the literature. McCleary, Aasen, and Slotnick (1999) found that the predictor variables most strongly associated with passing physiology were college grade point average and the number of college science courses taken before enrollment in physiology. Therefore, the researcher concludes that past college academic performance predicts academic performance in the subject of undergraduate human anatomy.

Being aware of students' college grade point averages can help direct the instructor to students who may initially have problems with the subject matter. Students who initially have difficulty with a college subject are often reluctant to seek help resulting in poor overall academic performance in the class or withdrawing from the class. Retention is key to increasing qualified health care workers; therefore, the feeder system for professional level lies in the undergraduate program. Acknowledging students of

differing academic ability and providing those less qualified with the necessary tools to succeed will help increase the success rate in this capstone course.

Furthermore, the researcher recommends educators of human anatomy identify those students with high college grade point averages and encourage them to be advocates for those students who may have lower grade point averages and lower self-efficacy. Becoming a peer tutor or developing a study group that includes students with lower self-efficacy could promote learning on the part of all students.

Conclusion Thirteen

Self-Efficacy and College Grade Point Average help to explain academic achievement (as measured by final grades) in an undergraduate human anatomy course.

This conclusion is based on the finding that self-efficacy and college grade point average combined enabled the researcher to account for 7.2% of the variance in final grades. Although not a high percentage, these findings reflect the findings of Pajares and Miller (1994) and Zimmerman, Bandura, and Martinez-Pons (1992) whose research found that self-efficacy holds greater explanatory and predictive power for academic outcomes than many other determinants. Numerous investigators have found undergraduate grade point average can be used to predict academic success in college (Chavous, 2000; Sternberg, 2005). Due to the explanatory power of self-efficacy and college grade point average, the researcher recommends instructors of human anatomy have made available to them their students' college grade point average that can be used as a reference point for potential academic trouble. The researcher further recommends instructors strongly consider administration of a self-efficacy instrument prior to the first lecture to identify students that may lack the confidence needed to succeed in the class. Early identification

of low self-efficacy can be used in addition to the known college grade point average to form study groups and tutoring groups for those students in need of academic assistance in the area of human anatomy.

Summary

Using these findings as building blocks, it is important to note the need for further research into factors that may explain the academic success of students in human anatomy. Additional research should include an examination of self-efficacy of students who complete the course and those that choose for whatever reasons to withdraw from the course. By doing so, attrition issues in the course can be addressed and help to identify students who enter the course with apprehension and/or angst caused by low self-efficacy and a low college grade point average. It is imperative science educators not assume that students having difficulty grasping the concepts of human anatomy are having this problem only in this specific course.

Attrition and retention in human anatomy is key to help alleviate the strain on the present and future health care system. More importantly is for educators to avoid "dummying down" the course in order to increase grades and maintain enrollment. Interventions for students in need of academic assistance must be considered especially for courses like human anatomy where detailed knowledge is needed to successfully complete the course.

It must be emphasized that a component of this study involved the level of self-efficacy of students enrolled in human anatomy. The researcher did not analyze students' university major, which may have some effect on the level of confidence the students possess. Similarly other variables as ACT and SAT scores, former introduction to

anatomy, and instructor of record were not used in the study. The variables in this study were a combination of factors that were both anticipated and not anticipated to contribute to the model based on previous studies.

To enhance the effectiveness of this study, the researcher recommends further research in an effort to increase the percentage found to explain the variance in final grades of students enrolled in an undergraduate human anatomy course at a research-extensive university. The researcher suggests building on this study by integrating these same variables with other variables that could further explain and predict final grades in human anatomy.

One major variable that should be considered is the students' declared academic major or field of study as this may hold explanatory power of final grades achieved. The findings of such a study could then be shared with the academic units which demonstrated lower success rates in an effort to effectively identify students in the troubled majors and offer academic assistance. Academic assistance could come in the way of peer tutoring that offers students an opportunity to learn vicariously through others, sometimes enhancing self-efficacy (Johnson, Johnson, Pierson, & Lyons, 1985). Administratively the university could sanction prerequisites to human anatomy that could help students formulate the study habits necessary for successful completion of the course as well as increase self-efficacy and outcome expectancy of the anatomy course.

Another recommendation would be to use a similar research project on various class sizes. With increases in community colleges, private medical programs, and smaller institutions of higher learning, class size may play a role in students' perceived ability to succeed in a complex course as anatomy. As Griffin and Griffin (1998) found, having

someone significant to the student believe and encourage the student's academic efforts often has positive results. Establishing instructor-student relationships are difficult with class sizes consisting of hundreds. And because persuasion can come in the form of positive and negative effects on academic achievement, an instructor's personal interest in the students' success is an important component of encouragement. Should class size be found to significantly relate to academic success in anatomy, research-extensive universities may want to rethink their philosophy of educating in mass numbers.

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APPENDIX A

CONSENT FORM

CONSENT FORM

1.	Study Title	The influence of self-efficacy and causality on student leaning in Human Anatomy
2.	Performance Site	Louisiana State University and Agricultural and Mechanical College
3.	Investigators:	The following investigators are available for questions about this student: 8:00 a.m. – 4:30 p.m. Wanda Hargroder 578-7178
4.	Purpose of Study:	To examine the hypothesized relationships among self-efficacy and causality Human Anatomy
5.	Subject Inclusion:	College students
6.	Number of subjects:	300
7.	Study Procedures:	The study will be conducted in three phases. In the first phase, subjects will spend approximately 15 minutes in completing the instruments. In the second phase which is the pilot study, subjects will complete the same instruments but treatment groups will be established. In the third phase, subjects complete same instruments and treatment groups established.
8.	Benefits:	The study will help Human Anatomy educators use respondent strategies to develop students' self-efficacy and causality response to enhance student learning and success in the subject.
9.	Risks:	No know risks as student's grades are not contingent upon participation and the subject matter will not be altered.
10.	Right to refuse:	Subjects may choose not to participate or to withdraw from the study at any time without penalty or loss of any benefit to which they might otherwise be entitled.
11.	Privacy:	Results of the study may be published, but no names or identifying information will be included in the publication. Subject identity will remain confidential unless disclosure is required by law.
12.	Financial Information:	There is no cost to the subjects, nor is there any compensation for participating in the study.
13.	Signatures:	

The study has been discussed with me and all my questions have been answered. I am direct additional questions regarding study specifics to the investigators. If I have questions about subjects' right or other concerns, I can contact Robert C. Mathews Institutional Review Board, 225 578-8692. I agree to participate in the study described above and acknowledge the investigator's obligation to provide me with a singed copy of this consent form.

_____ _____

Signature of Subject Date

APPENDIX B

DEMOGRAPHIC INFORMATION SURVEY

Demographic Information

Directions: Please answer each question truthfully. There are no right or wrong answers. If you have any questions, please ask me.

1. Your I.D. number (Last 4 digits of your social security number. This will be used strictly as a confidential identification number): ___ ___ ___ ___
2. Age: ____
3. Gender: ____ (male) ____ (female)
4. Classification: ____Senior ____Junior ____Sophomore ____Freshman
5. Department: _____
6. Major or emphasis: _____
7. Marital Status: ____Single ____Married ____Other
8. Employment: _____
9. Race (check one): ____Anglo-American ____African-American ____Hispanic-American
   . ____Asian-American ____Other (please specify)_____
10. What is the highest grade or year in school your father has completed? (Check one)
    . ____None ____9-12 but didn't graduate ____College Diploma
    . ____1-4 ____High School Diploma ____Some Graduate School
    . ____5-8 ____Some Years of College ____Graduate or Professional Degree
11. What is the highest grade or year in school your mother has completed? (Check one)
    . ____None ____9-12 but didn't graduate ____College Diploma
    . ____1-4 ____High School Diploma ____Some Graduate School
    . ____5-8 ____Some Years of College ____Graduate or Professional Degree
12. What type of work does your father do? _____
13. What type of work does your mother do? _____
14. High School GPA (on four-point scale): ____2.0-2.5 ____2.51-3.0 ____3.1-3.5 ____3.51-4.0
15. College GPA (on four-point scale): ____2.0-2.5 ____2.51-3.0 ____3.1-3.5 ____3.51-4.0
16. High School science score (on four-point scale): ____2.0-2.5 ____2.51-3.0 ____3.1-3.5 ____3.51-4.0

APPENDIX C

SELF-EFFICACY INSTRUMENT

Level of Confidence in Anatomy

Your answers will remain strictly confidential and WILL NOT affect your grade in this course. For each of the following items, CIRCLE the ONE number that best describes how you feel.

1 = strongly disagree (SD)
2 = disagree (D)
3 = neutral (N)
4 = agree (A)
5 = strongly agree (SA)

		SD	D	N	A	SA
1.	I am confident I have the ability to learn the material taught in anatomy.	1	2	3	4	5
2.	I am confident I can do well in anatomy	1	2	3	4	5
3.	I think I will do as well or better than other students in anatomy.	1	2	3	4	5
4.	I don't think I will be successful in anatomy.	1	2	3	4	5
5.	I am confident I can understand the topics taught in anatomy.	1	2	3	4	5
6.	I believe that if I exert enough effort, I will be successful in anatomy.	1	2	3	4	5
7.	I feel like I don't know a lot about anatomy compared to other students in this class.	1	2	3	4	5
8.	Compared with other students in this class, I think I have good study skills.	1	2	3	4	5
9.	Compared with other students in this class, I don't feel like I'm a good student.	1	2	3	4	5
10.	I am confident I can do well on the lecture exams in anatomy.	1	2	3	4	5
11.	I am confident I can do well in classroom discussion.	1	2	3	4	5
12.	I am confident I can do well in the lab work for anatomy.	1	2	3	4	5
13.	I think I will receive a C or better in anatomy.	1	2	3	4	5
14.	I don't think I will get a good grade in anatomy.	1	2	3	4	5
15.	I am confident that I could explain something learned in this class to another person.	1	2	3	4	5

APPENDIX D

OUTCOME EXPECTANCY INSTRUMENT

LEARNING OUTCOMES IN ANATOMY

Listed Below are the outcomes that you are supposed to obtain from this course. In the first column, indicate the likelihood of each outcome from 1 (not at all likely) to 10 (completely likely). In the third column indicate the value of each outcome you view, from 1 (not at all valuable) to 10 (extremely valuable).

LIKELIHOOD	LEARNING GOAL	VALUE
1 2 3 4 5 6 7 8 9 10		1 2 3 4 5 6 7 8 9 10
Not at all likely ---- Completely likely		Not at all valuable --- Extremely valuable
	I will acquire a thorough knowledge of the structural organization of the human body and become proficient in describing the functional aspects of gross anatomy.	
	I will understand the structural relationships between individual parts that form an integrated whole.	
	I will become fluent in the terminology and vocabulary of gross anatomy.	
	I will be able to identify expertly specific structures on diagrams and models.	
	I will understand selected clinical disorders that arise from abnormalities in structure.	
	I will be able to analyze body systems and organs in terms of the details of their structure.	
	I will learn the anatomical structures and concepts that will help me to succeed in my college program.	
	I will understand the "big picture" of how the anatomic structures work together.	
	I will understand and be able to apply the clinical relevance of anatomic structures.	

VITA

Wanda Green Hargroder was born in Gary, Indiana, on October 31, 1950, to the late Leemon Earl Green and Mattie Beatrice Moore. She graduated from Winnsboro High School in 1968 and received a Bachelor of Science degree, majoring in zoology in 1972, from Louisiana State University. She then began working at Exxon as a research analyst and then married. After having three daughters, she returned to Louisiana State University in 1986 to obtain a Master of Science degree in kinesiology.

After receiving her Master's degree, in 1988, Ms. Hargroder went to work with the Baton Rouge Association of Retarded Citizens (ARC) as an administrator of adult services. In 1992, she began her career at LSU serving as Assistant Director of Recreational Sports. During those years she became actively involved with orientation of new students and worked on numerous campus committees. Through this association, she became the Assistant Dean of Students in 1996. Beginning in 1994, Wanda became an adjunct faculty member in the Department of Kinesiology, where she found her passion for teaching. It was this passion that led her to a full-time faculty position in the LSU Department of Kinesiology in 2002.

Realizing the importance of a doctorate degree in a Research-One Institution, Wanda began her doctoral graduate studies. Because she had taken previous classes in another discipline besides kinesiology, her doctorate fell under the direction of Dr. Michael Burnett, Director of the School of Human Resource Education and Workforce Development.

As a faculty member, Wanda's teaching responsibilities include human anatomy lecture and lab. Additionally, she serves as the coordinator of the Human Movement

Practicum, which she organized and implemented in 2005. Beginning with her hire in kinesiology, she and Dr. Dennis Landin had a vision of pursuing and implementing a cadaver lab for students pursuing medical careers. She studied at the medical school at the LSU Medical School to prepare for teaching in a cadaver lab. Following the move of the Medical and Dental School to the LSU Baton Rouge campus after Hurricane Katrina, the possibility of such a lab became a reality. In the spring semester, 2007, the first undergraduate cadaver class began with the collaborative efforts of the LSU Veterinary School, LSU Dental School and the LSU Department of Kinesiology.

Besides teaching and serving on University committees, Wanda remains an advocate of persons with disabilities, having served as President of the Board of Directors of the Baton Rouge ARC, and remains a consultant to the organization. Professional organizations include the Human Anatomy and Physiology Society to which she has been nominated to serve as the Southeast Regional Director for the 2007-2009 term. She is also assuming the responsibility of Annual Conference Co-Chair for the 2008 HAPS conference that will be held in New Orleans in collaboration with the LSU Medical School.

Wanda is the very proud mother of three daughters and one son-in-law, Leigh Reagan Bonfanti, Mary Michael Bonfanti, Brindly and David Downs.